002089

JPRS-ESA-84-041

20 November 1984

East Europe Report

SCIENCE And TECHNOLOGY

FBIS FOREIGN BROADCAST INFORMATION SERVICE

4
95
A05

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-ESA-84-041

20 November 1984

EAST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

GDR STEEL ROLLING MILL FOR BULGARIA

East Berlin BERLINER ZEITUNG in German 8-9 Sep 84 p 3

[Unattributed article]

[Text] Bulgaria, which in 1939 still had to import nearly every needle and every nail, is currently 16th in the world in terms of per capita steel production. This dynamic recovery is based on long-term planning which extends as far as the beginning of the next century.

Within CEMA, Bulgaria has specialized in the manufacture of about 700 kinds of machines, systems and devices. The necessary metallurgical processes for such production are currently being expanded: At Burgas the nation's third metalworking center is under construction, for which the GDR is supplying a complete rolling train and is supervising installation work. The 1200 m long by 300 m wide "small section rolling train 300" supplied by the "Ernst Thaelmann" heavy machine construction combine in Magdeburg (SKET) is the largest industrial machinery complex ever supplied to Bulgaria by the GDR. It is one of the most ambitious projects of bilateral cooperation within the current five-year plan. Specialists from both nations began the installation work in the middle of May. A total of 16,000 metric tons of equipment will be transported from the GDR to Debelt.

Following its completion the plant, at a rolling speed of 20 m per second, will supply 800,000 metric tons annually of steel angle, rails and other steel shapes for Bulgaria's machine construction industry. The six-month trial operation period should begin at the end of 1985.

The entire plant will be operated by an automatic control system which includes a Robotron process computer. The advantageous are obvious: Rolling, storage, and loading and unloading of the rolled steel are accomplished without great physical effort on the part of the workers.

And for the Magdeburg combine, steeped in tradition, the erection of this plant in Burgas-Debelt represents a unique venture because it is being built "from scratch", so to speak. In the past, SKET has supplied its rolling trains only to existing metalworking plants.

Debelt is only one example of the multi-faceted, mutually-advantageous cooperation between our two countries. Cooperation in research, development, and also in part in manufacturing, thus extends from catalytic chemistry and the production of energy from brown coal to robotics and optoelectronics.

As of this year the mutual exchange of goods in one of the most important branches of industry in both countries, machine construction, has achieved a ratio of 1 to 1. The 1984 foreign trade report thus provides for Bulgarian exports of hoisting and transport equipment, machine tools and woodworking machines, as well as computers and communications equipment, while the GDR will export, among other things, open-pit mining and rolling mill equipment, textile machinery, machine tools and agricultural equipment to Bulgaria.

12644
CSO: 2302/21

GDR-ROMANIA MACHINE TOOL COOPERATION

East Berlin BERLINER ZEITUNG in German 23 Aug 84 p 3

[Article by Ina-Maria and Michael Hube, Bucharest: "Good Cooperation in Machinery Construction: Installations from Berlin, Groups of Machines From Bucharest"]

[Text] The 17 m long, 10 m wide ZFWZ 100 gear cutting machine manufactured by the "7th of October" combine is the largest machine tool shipped to date by the GDR to Bucharest. Roughly 20 freight cars were needed to transport the machinery, which was installed in the factory in Bucharest by GDR specialists for machine tools and assemblies.

This large-scale factory in Bucharest, which manufactures special machines for the electric motor, automobile and tractor industries, is a cornerstone of Romanian industry, and much of its equipment and machinery bears the name-plates of GDR factories. In addition to gear cutting machines, WMW-Export also supplied numerically controlled lathes as well as grinding machines.

Cooperation between the GDR and Romania in the area of machine tool construction is already 20 years old. The export of over 500 internal and external cylindrical grinding machines and multi-spindle automatic lathes needed by Romania for expansion of its rolling-contact bearing industry is planned for the next several years. For their part, factories in Bucharest, Resita, Braila, Bacau and other Romanian machine construction centers are manufacturing subassemblies for presses and planing machines to be supplied to the GDR within the scope of specialization and cooperation between both countries.

In the Tirgoviste stainless steel combine, a "small section rolling mill 320" manufactured in the GDR has started operation. It was manufactured in the "Ernst Thaelmann" heavy machine construction combine in Magdeburg. The new small section rolling mill is scheduled to produce 320,000 metric tons of special steel annually for use in the machine construction, chemical, automobile and tractor industries as well as in the construction industry. A rolling train erected as long ago as ten years with the help of the people of Magdeburg is today still operating flawlessly.

The combine, which today encompasses five factories as well as modern laboratories and training centers, serves the large-scale metalworking factories in

Bucharest, Craiova, Pitesti and Ploiesti with supplies of 600,000 tons of special steel annually, and is an absolute necessity for further industrialization of this former farmland.

By the end of 1985, the combine's roughly 9000 workers want to produce one million tons of rolled steel. This project is supported by regular seminars held for many years by the rolling mill workers in this city on the Ialomita together with their colleagues in the Brandenburg steel and rolling mill, as well as in similar factories in the Soviet Union and Czechoslovakia.

12644
CSO: 2302/21

THEORY OF INFORMATION, AUTOMATION IN CZECHOSLOVAKIA

Prague RUDE PRAVO in Czech 3 Oct 84 p 6

/Article: "Successful Mathematical Theories"/

/Text/ The Institute of Information and Automation Theory of the Czechoslovak Academy of Sciences /CSAV/ was founded on 1 January 1959 from the CSAV Laboratory for Automation and Teleautomation, the mathematics division of the CSAV Institute for Radio and Electronic Technology and a newly-constructed computer center. It has been directed from the beginning by Academician J. Kozesnik.

The institute is divided up into research divisions in information theory, automated control theory, operations research and multidimensional signal processing, a computer systems division and other sections assuring the functioning of the institute.

The automated control theory division is systematically working on the development of systems theory, decisionmaking theory, optimal control theory, and control utilizing higher level intelligence. These efforts have produced a number of discoveries. Systems theory is helping in the discovery of the internal structure of complicated equipment with several inputs and outputs. This knowledge is being used, for instance, in designing equipment where individual input magnitudes are to influence only directly related output magnitudes. Decision theory has succeeded in developing data reduction techniques which are the basis of technical and medical diagnostics.

The design of specialized equipment and software development are both components of basic research. This sector has continued with earlier traditions and developed a pseudorandom signal generator, stepped magnetic tape drives for the recording of measurement data from operations, magnetic tape memories for small computers, and time lag models. In the software area extensive sets of programs have been developed to guide regulational tasks on digital computers.

These theoretical findings are being applied to various areas of the national economy. In conjunction with the Czech Gas Works Enterprises a model has been developed of our gas supply network, including the transit pipeline. The model is designed to facilitate the management of this network and to predict needs for gas, with the objective in upcoming years of fully automating this network. Work for the Velesin South Bohemian Machinery Works has included the design of

a system for regulating engine revolutions of turboprop aircraft and the design of a microprocessor-based regulator for experimental testing. It has worked on the development of these modern, compact and reliable regulators with the Kolin Tesla Institute and the Resezrch Institute for Automation Equipment in Prague. Programmable regulators which automatically adapt to changing conditions are currently controlling the papermaking machines in the Olsankse Paper Mills and have been successfully tested on the control of the rolling mill stands at the Skoda Works in Plzen.

The information theory division has significantly expanded and generalized the basic theorems of information theory concerning the transmission of messages along noisy communications channels. Possibilities have also been found for utilizing the results of mathematical information theory for the evaluation and processing of complicated decisionmaking procedures.

Results of research in the area of statistical decisionmaking have been applied in the adaptive control of random processes as well as to automated task resolution, which is one of the critical questions of so-called artificial intelligence, and is also related to problems being worked on in robotics. A further area of application of the general approaches of statistical decisionmaking has been the detection and filtering of random processes, above all in conjunction with the Institute for Radio Research in Opocinko, while processing coded, digital, radiolocational signals. More recently, these techniques have been applied to the testing of hypotheses and estimates in the so-called theory of random poles in remotely conducted research on the earth.

Theoretical research is rounded out by the development of programs for the computer resolution of probability problems.

The operational research sector is devoting its attention to the development of a theory of control for dispersed systems with the focus on probability questions related to the control of changes in their structure. Sectoral employees offer frequent consulting services to employees of sectoral institutes, such as in the fields of power generation, communications, ecology and medicine. In cooperation with the Power Industry Research Institute, it has formulated a special technique for the control of boiler-turbine units which utilizes contemporary equipment and resists chance imprecision. Hierarchical control techniques have been used to monitor reservoirs for the quality of water resources and their influence on the surrounding environment.

The primary public goal of the work of this sector is the application of theoretical results to the preparation of future but not yet completely designed automated decisionmaking for the control of integrated electricity systems.

The founding of the sector for the processing of multidimensional signals resulted from a need to test the results of theoretical research by experimental techniques. The first task of this experimental division was the development of random signal sources (GENAP), to be used for the modeling and testing of results of theoretical work in the fields of probability and mathematical statistics.

The development of highly-specialized equipment for the generation of previously specified characteristics of random progressions has made it possible to link up with foreign cooperative ventures in the management of optimal reservoir quality in the presence of the random influence of external factors. Furthermore, this equipment has been utilized in cooperation with the Aviation Research and Testing Institute in Letnany for dynamic and strength tests of airframes, in cooperation with the Koprivnice Tatra national enterprise to resolve the issue of optimal vehicle suspension sysems by using the general theory of random processes, with the Bechovice Power Industry Research Institute on the identification and modeling of frequency deviations within the power grid, and with Blansko Cesko-Moravska Kolben Danek to resolve questions of automated measurement with the objective of improving the reliability of water turbines.

This sector is working on a comprehensive resolution of the problem of collecting, recording and processing data at an actual facility. To test theoretical results related to data reduction, extensive collections of data were obtained for the requirements of medical diagnostics, with the results being used in the practical activities of health care facilities for the identification of individuals whose health is at risk.

The tasks with which the CSAV Information and Automation Theory Institute is concerned have their origins in practical needs, and are being resolved at the highest possible theoretical level, but always in such a way that the results may be applied immedidately.

9276
CSO: 2402/1

GDR-USSR POLYURETHANE RESEARCH, PRODUCTION DESCRIBED

East Berlin PRESSE-INFORMATIONEN in German No 83, 19 Jul 84 pp 3-4

[Interview with Dr Albert Meyer, general director, Schwarzheide VEB Synthetic Works, SYS Combine; date and place not specified]

[Text] [Question] Around three-quarters of the products manufactured by the SYS combine are made of polyurethane. What is their significance with regard to the national economy and the CEMA countries?

[Answer] The GDR polyurethane chemical complex was established in the Schwarzheide synthetic works in order to meet the demand of the national economy and to continue refining petrochemical base materials. The synthetic works are the largest polyurethane manufacturer in CEMA, and are continually making advances in production in accordance with the national economic interests of the GDR and the other CEMA states, in particular within the framework of an agreement between the governments of the USSR and the GDR. Today, for example, all of the flexible polyurethane foam used in upholstering Ikarus buses is made in Schwarzheide. The refrigerator factory in Minsk, the capital of the Byelorussian SSR, uses exclusively rigid polyurethane foam from Schwarzheide as an insulating material.

Our current product range includes various polyurethane components and systems which are processed by the user to form rigid, flexible and integral polyurethane foam, elastomers and many other types of products. The level of polyurethane production reached in the GDR has made many end products competitive and profitable.

The SYS combine supplies well over 100 polyurethane components and systems to numerous firms both at home and abroad. Among these products are rigid polyurethane foam products used as insulating materials or simultaneously as structural elements, primarily in the construction and transportation fields as well as in the household refrigerator industry. An equally high demand exists for flexible polyurethane foam for use as upholstery material in the furniture industry, integral flexible polyurethane foam for use in the motor vehicle industry, and polyurethane elastomers--strong materials for use in the machine construction industry--among others.

[Question] What effect are the many years of cooperation with Soviet partners having on our own production?

In July 1969 the GDR and the USSR reached an agreement on scientific and technical cooperation in the development of each country's own processes for the manufacture of polyurethane. Both partners have now been working together for 15 years in a socialist partnership which has led to the discovery of ways and means of accomplishing the tasks before us in a manner advantageous and useful to both countries.

To do this, we have established a versatile system of cooperation, which in each country incorporates roughly 20 institutions with over 2,000 employees. Among other things, these institutions are active in the fields of raw materials, applications research, processing machinery, research of fundamentals, analysis, standardization and proprietary law. This work is currently being done in 12 specialist working groups.

These methods of cooperation allow significant reduction of material costs for new developments on both sides. In addition, we have been able to accelerate new developments by unifying existing human resources and by working jointly on all facets of basic problems. The close and purposeful cooperation between both partners has been and still is the basis for increased production. Through intensification of production facilities, for example, we are currently able to manufacture considerably more polyurethane than was originally planned.

[Question] What recent results emphasize this close cooperation?

[Answer] Our joint work concerning the use of polyurethane covers all areas of the national economy. In the last few years cooperation has centered on the development of raw materials and technologies for the production of consumer goods.

So far our scientific and technical work has led to a total of 81 joint inventions, of which 14 are used in production in the GDR, thereby making an annual contribution of some 50 million marks. Our joint work in the field of polyether alcohol deserves special mention, however, excellent results have also been achieved in the development of rigid polyurethane foam systems. The construction of production facilities for polyether in Nishnekamsk and Sumgait now also means that the first joint inventions are being used by the Soviet Union.

[Question] What effect does the constant exchange of specialists have on the level of cooperation?

The direct exchange of specialists is one of the most effective methods of working on scientific and technical projects. Soviet researchers, for example, are engaged in work on joint projects with their counterparts at the Schwarzheide VEB Synthetic Works, the Nuenchritz chemical plant and the Greiz plastics technology plant. Specialists from the GDR are doing the same at the Institute for Synthetic Resins in Vladimir. The results of this cooperation are 18 standards which are valid in both countries and represent the foundation for further joint projects.

[Question] Polyurethane elastomers are relatively new products manufactured in Schwarzheide. How can they be used, and what impact do they have on the machine construction industry?

[Answer] Polyurethane elastomers are rubbery materials which are exceptionally resistant to wear. They are characterized by resistance to gasoline, oil and most greases. Polyurethane elastomers are ideal for use in agriculture and in nearly all industries in the form of molded parts.

Due to their better mechanical properties, they are replacing more and more molded rubber parts. This applies in particular to polyurethane hardness ranges for which rubber parts are not satisfactory. Polyurethane elastomers, for example, have largely replaced pins, claw couplings and other flexible coupling components formerly made of rubber or leather. Such applications make use of the above-mentioned advantages of polyurethane elastomers as well as their good resiliency; full transmission of high torques is guaranteed. Couplings made of this material last three to four times longer than their rubber or leather counterparts.

We do not yet know as much about polyurethane elastomers as we do about conventional elastomers. The Schwarzheide synthetic works has taken on the task of promoting use of this valuable material in the national economy and opening up new areas of application in close cooperation with users in the GDR and in the CEMA countries.

12644
CSO: 2302/11

GDR-USSR SCIENTIFIC, TECHNICAL COOPERATION REVIEWED

East Berlin DIE WIRTSCHAFT in German, Special Issue on 1984 Leipzig Autumn Fair pp 86-87

[Article by J. Medwedkow, secretary charged with the Soviet Portion of the Joint Government Commission for Economic and Scientific-Technical Cooperation between the USSR and the GDR]

[Text] The dynamic growth of exports and imports, and the volume of foreign trade resulting therefrom, are very important for characterizing the development of economic relations between two countries. The figure for USSR-GDR foreign trade is quite high. For example, according to documents on the 1981-1985 Long-term Agreement on Foreign Trade, it will be in excess of R14 billion in 1984.

Another indication of dynamic growth is the fact, that at the 1984 Leipzig Spring Fair, the Soviet foreign trade associations have signed trade agreements with GDR firms and organizations for over R2.5 billion.

Economic cooperation between the USSR and the GDR has produced a volume of foreign trade that is unparalleled in trade relations between two countries. The range of goods exchanged between our countries includes more than 1,500 product groups.

In the current situation, systematic implementation of the economic and scientific-technical cooperation agreements is of particular importance for the future development of our contacts. As is well-known, the USSR-GDR production specialization and cooperation program signed in late 1979 has a big role to play in this during the period up to 1990. The program determines the focus of economic cooperation between the two countries in the production area. Pursuant to the agreement, the industry ministries of the USSR and the GDR are negotiating today practical specialization and cooperation measures aimed at improving industrial production. So far, there are 35 major areas for specialization and cooperation that are organized in line with the various sectors of the economy.

"By developing and strengthening to the best of our efforts the solidarity and cooperation with the countries of the socialist community in all areas, including such important ones as the economic area, we are making a large

contribution to the peace, progress and security of all nations," said Konstantin Chernenko at the 1984 CPSU Central Committee plenary.

It is well-known that Soviet deliveries exert considerable influence on the development of the GDR's economic resource and technological base. As part of the USSR-GDR Parity Government Agreement on Economic and Scientific-Technical Cooperation, appropriate bilateral agreements have been and are being concluded.

The measures covered by those agreements are, for instance in the chemical industry, primarily determined by the extremely small crude oil and natural gas reserves in the GDR. But the GDR has a large potential for manufacturing chemical products which are not energy-intensive, but require multi-phase technologies. The Soviet economy, on the other hand, needs large quantities of chemical products and chemical equipment of various kinds. Mutually advantageous shipments of chemicals manufactured in the USSR or the GDR as a result of the changed production structure, have already begun.

It is a well-known fact that the fuel and energy balance must be revamped in line with progressive principles. Another significant example is our transportation system in which most combustion engines use only light crude oil products, i.e., the most expensive type of liquid fuels. Our countries are working together to convert some gasoline-operated trucks to use the much cheaper liquified natural gas. Through joint efforts, it has been possible to resolve upcoming technical problems within a relatively short time. The USSR has started with the construction of gas stations.

The program and the 35 main specialization and cooperation areas seek to concentrate on certain production processes in a way that would make it possible to ensure optimal production series and to introduce, on this basis, highly effective technologies. As a result of these agreements, productivity in manufacturing industrial parts could be increased in a number of Soviet and GDR firms by a factor of 1.5 - 2.0. Productivity in manufacturing other goods also rose, e.g., of cutting machines, electronic elements and technical equipment for their production, as well as of equipment for railroad cars, chemical and other instruments.

Our countries have also been able to economize fuel, raw materials and other materials. This made it possible to cut, for instance, the 1982 fuel consumption of 11 Soviet glass-melting furnaces by 8-10 percent and glass breakage by 3-5 percent. They also worked together in building new carts for the transport of brick, stoneware and ceramic products and of products of some other industries in kilns for firing. This enabled them to reduce their solid fuel consumption by 25 percent, heat losses by 10-15 percent and the use of labor by one-half.

For the construction industry, new building elements, which are now being introduced, have been jointly developed and tested. That means that these elements can now be produced with a substantially lower steel and cement content and at lower labor costs.

Active cooperation in the electronics area serves to accelerate production in the electronics industry. While in 1976, i.e., prior to the adoption of the production specialization and cooperation program, the GDR's microelectronic production totaled a mere couple of million marks, it is nowadays many times more than that.

At the same time, the range of available goods, which today includes a growing number of new products, is expanding. The number of technologies is on the increase. This broadens the availability of electronic products in line with current industrial requirements. This is the basis for manufacturing electronic equipment, electronic data processing installations, radio and television receivers with highly integrated circuits and for making machine tools, presses, automated assembly lines and microcomputer-controlled equipment.

The USSR-GDR production specialization and cooperation program affects, to a significant extent, the future dynamic development of our national economies.

The year 1984 has particular importance for the GDR. In October, the GDR is going to celebrate the 35th anniversary of its establishment. The Soviet workers, by fulfilling their commitments to their colleagues and coworkers in the GDR, and the broad-based socialist competition in the Soviet firms in honor of this anniversary, will make a new contribution that will further strengthen their brother republic in the economic area and deepen our cooperation in all spheres.

Picture Captions

A pulse generator for the GDR's 3.5 GV was installed in the Zaporoshye transformer plant to test transformers. Transformers from Zaporoshye are exported to many countries, including Bulgaria, the GDR, Poland and Czechoslovakia.

In the Gruzneftegeofisika association's EDP center, specialists from the GDR are working with their Georgian colleagues to set up, arrange and put the ES 1055 M EDP station into operation. It is programmed for half a million operations per second and is being used in conjunction with ESER-Series equipment from other socialist countries for crude oil and natural gas exploration by the Georgian SSR.

The second phase of the albumen and vitamin concentrate producer Mozyr (Byelorussian SSR) is under construction. Its projected annual production is 90,000 tons of fodder yeast. Here, a vacuum evaporator installation set up with the assistance with GDR specialists.

7821
CSO: 2302/32

PLASTICS RESEARCH COOPERATION WITH USSR

East Berlin NEUE ZEIT in German 2 Oct 84 p 6

[Article by G. Keil: "How Polymer Materials React: Rheologic Research Toward Improvement of Plastics Properties"]

[Text] Scientists at the "Carl Schorlemmer" Technical College in Leuna-Merseburg are involved in basic rheologic research into improving the properties of plastics. Rheology is that branch of science in which the deformation and flow characteristics of fluids and solids are studied. Applications for rheology include not only chemistry but also foodstuffs and processes within the human body, for example. Using various methods, scientists at the technical college are investigating what structural changes occur in polymers as a result of tensile, compressive and thermal loading. The results of these investigations give us an understanding of the processes which take place in the materials as well as their properties. This research is very important for the processing of these materials; precise production methods can be established. The goal is to improve the characteristics of conventional plastics for various applications.

Therefore, the scientists' collective investigated among other things the expansion characteristics of tubing materials used for packaging, in agriculture and in the construction industry. At the same time scientists in the materials technology department helped to develop new plastics for special applications. These special plastics are manufactured from mixtures of different kinds of polyethylene or as filled plastics. The so-called filling of plastics saves material as well as making it possible to better tailor the material, especially different types of rubber, to individual applications. Fillers include chalk and carbon black, among others. Here, the effects of the filler/polymer combinations must be fully understood, and the combinations optimized.

In cooperation with the Buna Chemical Works it has been possible to further improve certain types of products based on these mixtures. The research at the technical college in Merseburg is being conducted in close cooperation with the Leningrad Technological Institute and the Moscow Institute for Construction of Chemical Machines. Both institutions provided significant assistance in establishing rheology as a branch of research at the technical college.

12644
CSO: 2302/21

GDR MANUFACTURING TRAINING: MODEL FOR CEMA ENGINEERING SCHOOLS

East Berlin FEINGERAETETECHNIK in German Vol 33 No 9, 1984 pp 386-387

[Article by Prof Dr W. Lotze, Dresden Technical University, Production Engineering and Machine Tool Division: "Automated Manufacturing--a Challenge for Industrial Metrology"]

[Text] Based on the development of microelectronics, an exponential change in technology has begun worldwide and has also reached the manufacturing sector of the metal-working industry. Automation is in effect becoming the standard solution for technological problems and--beginning with research right down to the last work station, even to the area of adult education--is questioning the ideas, principles, methods and reasoning that have evolved in over a century of technological development. To find answers and progressive solutions within a short period of time that do not burden, but promote the social and economic welfare of all people in our socialist society, that is the party's and government's challenge to science and technology.

The task of the manufacturing metrology is to guarantee in the metal-working industry the transition to largely automated, labor-saving production by designing procedures and instruments for process-linked testing of parts. Over the past one hundred years, conventional machine tools and test methods were adapted as much as possible to manual operation by people. Limit gauges, calipers and micrometers are eloquent examples of it. Placing these conventional testing tools into the "hands" of a robot at the machine is, no doubt, neither technically nor economically the best solution, although it makes it possible to demonstrate first examples of flexible automation of process-intensive parts testing. New process-linked, highly automated and flexible test tools must be developed and they must be integrated everywhere into the production process. This integration must take place with regard to both the flow of work and of information.

Developing tasks and solutions that address the needs of the future poses new tasks for the metrological instrument industry, the training of skilled workers and engineers, basic research and state-sponsored metrology. Yet a whole series of solutions and experiences, which can be used as examples, have already been developed. The successful Leipzig Spring Fair has provided numerous convincing examples from the GDR and abroad. While in the early stages of development, there was only large-scale equipment such as two and three-coordinate measuring

tools that were linked to computers, this year's fair produced numerous examples for integrating microprocessors into small digital measuring tools. A new generation of measurement control equipment for machine tools is growing beyond the conventional applications in circular grinding machines. New operating principles, such as optical image processing based on solid-state sensors, are becoming part of the measurement technology and machine tool control. Measuring calipers in coordinate measuring equipment have found a solid place in tool cribs that are available in numerically controlled processing centers. Many conventional machine tools have been completely revamped as a result of the inclusion of digital displacement measuring systems and of numerical controls and, through the use of robots and tool cribs, have been transformed into highly automated processing centers. Computer-controlled three-coordinate measuring equipment is now available at such a high level of automation that they operate on the third shift without any operating personnel or that they can be tied directly into the conveyorbelt system of integrated production phases as a universal and flexible measurement center. However, many problems remain to be solved. For instance, attempts to achieve an optimal and economical solution for process-linked parts testing in turning centers have not yet been successful, and opinions still differ on where to best arrange the measuring instruments, inside the machine where many errors are possible, or outside the machine where time separation from the manufacturing process is a disadvantage, and that requires above all considerable examination and experience with their practical use in industry.

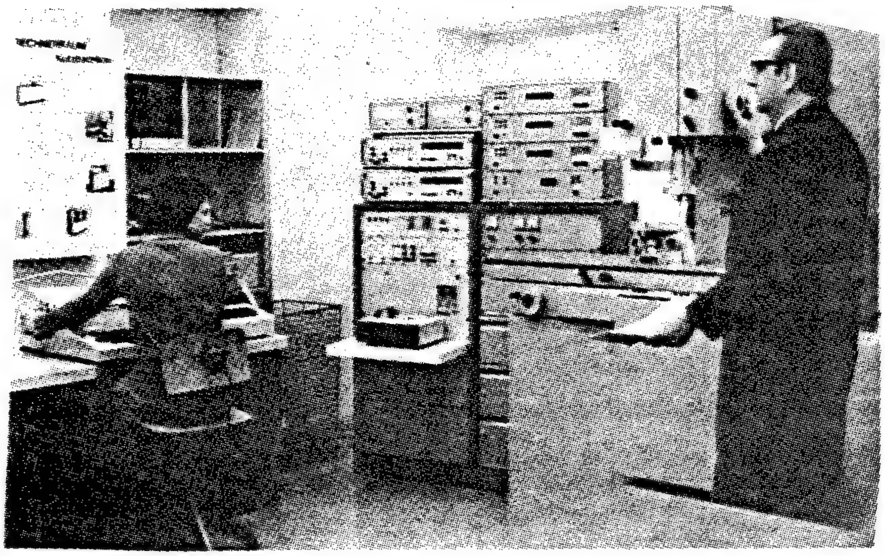
The transition to a new, highly automated generation of measuring instruments, which are integrated into the computer-controlled production process and which maintain great flexibility, requires--in addition to new design solutions based on mechanical, optical, electronic and other operating principles--more software without which a modern measurement instrument with integrated microprocessor or connected to a subordinate computer, simply can no longer be operated or integrated. These fundamental changes in the development of equipment have a profound impact on the necessary plans and the potential for research on, and the development of, automated measuring equipment. It is a special challenge for the young generation of engineers who is still in school today and who is preparing itself for the tasks of the next decades. The decision of the Politburo and the Council of Ministers to further the development of engineering education gives industry and the universities all possible means to design progressive new forms and contents.

It is against this background that the 60-year-old chair for Length Metrology and Scientific Elements of Construction with Interchangeable Parts, which was established in 1924 by Prof Dr phil habil, Dr Ing honoris causa G. Berndt and which is today part of the Industrial Metrology sector of the Technical University in Dresden, must be seen. In its efforts to combine teaching and research, this educational and research institution has been working and continues to work, for scientific leadership in the areas of length measurement technology and and construction of interchangeable parts. Through their relentless efforts in these fields, which are so important for both production and quality assurance in the metal-working industry, this subject area has been expanded over the past 60 years with the help of more than 540 master's theses and 75 doctoral dissertations

submitted by young and creative engineers who kept the practical applicability of their ideas in mind. Affiliated institutions have been set up at the technical universities in Karl-Marx-Stadt and Magdeburg which today provide training to meet the needs of industry for professionals in the area of quality assurance, for the development of new test equipment and for the government's metrology facilities. Technical universities and a large number of universities abroad, especially in the USSR and the other socialist countries, have adopted Dresden's training model.

During the past 10 years, the focal point for research at the Dresden Technical University has been and remains computer-based coordinate measurement technology. Research, education and continuing training as well as consultations with industry have been promoted and intensified by linking it with the photogrammetry area of the geodesy and cartography section at the Methodological Diagnostic Center for Coordinate Measurement Technology. Supported by an interdisciplinary team and modern equipment, many practical contributions have been made to the theory, evaluation software, application and auxiliary equipment of the coordinate-measuring instruments manufactured by the VEB Carl Zeiss in Jena.

For years, the universities have been collaborating closely in the areas of basic research and training. Equipment acquisitions were made for mutually agreed focal areas and, since 1978, the potential was optimally utilized to train students by way of regular student exchange programs. In recent years, the Dresden chair has placed particular emphasis on the application of computer engineering in order to be able to provide industry with cadres of engineers who received above-average training. By continuing to tailor training and research towards automated labor-saving production in the metal-working industry, both teachers and students are preparing for the new generation of highly automated production systems and are attempting to make their contribution to the development and introduction of this new technology on the basis of universal systems for the computer aided scientific and technological preparation and management of production. At the 35th anniversary of our country, university professors and their staff working in the production measurement technology field are looking with pride at their--thanks to generous support--modern, well equipped socialist educational and research institution and its 60-year tradition. In close cooperation with industry, with the other universities and with the state's metrology organizations, we are approaching the new tasks in light of worldwide changed economic conditions and are fighting for the education and training of young competent professional cadres as well as for research results that will satisfy the requirements of the year 2000.



Coordinate measurement room with DKM 300-D, equipped with scanning device, microprocessor and data connection as well as terminal for Soviet process computer SM4.

7821
CSO: 2302/17

RESEARCH DIRECTOR ON ESER EC 1056 SERIES PRODUCTION

Dresden SAECHSISCHE ZEITUNG in German 19 Jul 84 p 3

[Article by Orof Dr Gerhard Merkel, Director of Research and Development, VEB ROBOTRON Combine]

[Text] In January here in Dresden our new EC 1056 electronic data processing system goes into production. Besides better service, easier error detection and several other innovations, its most striking feature is a new operating system. Because of it, the user of our new system will be able to double the efficiency of processing his programs. Although the basic speed of the new system is roughly the same as that of the old one at 480,000 calculations per second, the user of the new system will, in practice, enjoy doubled performance. A further advantage: the new operating system is compatible with all previous EC 1055 and EC 1055 M systems.

Simply stated: Without one ounce more of material, it will be possible to produce with this operating system--as it were, a concentrated output of concentrated intellectual processing--to achieve doubled performance. That is certainly an extremely favorable development. But in my opinion the example illustrates concretely how the economic strategy of our party is justifiable. The economic possibilities of science and technology are inexhaustible.

The Suitcase Analogy

In all successes and also in failures we have experienced a basic empirical fact: He who sets his goal too low never succeeds. We assume that is is precisely where the responsibility of leaders lies.

The suitcase analogy is often cited. Into a suitcase which appears full, an additional garment can always be made to fit. Of course, there is a final limit at which the suitcase bursts. This result is however,--as experience teaches us--rare when the interaction of goals with possibilities is being considered. Utopian goals are certainly not expressions of progressive attitudes. It is however, equally wrong to be too quick to compromise in the fact of difficulties. The real yardstick as an exceptional effort toward a planned success.

Away From Externals--Into Basics

Formerly average values were set as economic goals for developmental capacities in the combine: 30 percent reduction in materials used, 25 percent reduction in production time and so forth. This was a beginning but was not suited in the long run to the difficult struggle for a marketing position in the world market.

More and more we are working now under the handicap of limits: What is the maximum that a new product can cost? What is the maximum production time that can be invested in it? What are the upper limits of materials which can be used? And more importantly: What reliablity is consistently required? The limits only make sense if they actually result from an entirely honest, merciless comparison with world production. This measurement by world standards especially requires new qualities, must reach to basics completely apart from the competitive end product, must venture into the planning groups of technology, of economics. This requires more thought even before the onset of planning than formerly as well as more knowledge of modern engineering and technology. The needed economic results are, as it were, preprogrammed.

Other Approaches No Longer Work

Of course, limits alone do not guarantee success. Even more important is the absolute marketability of products. Researching, understanding and precisely meeting the needs of the customer with a particular product--other approaches no longer work. The best economic results will not be achieved if production somehow manages to ignore the customer. We need to get important input for research and development from our own international traders in the combine.

The S 6005 Lesson

We hold ideas and solid work in highest esteem. For example: In the combine the production of a new portable electronic typewriter, the S 6005, has just begun. It is neither lighter nor does it print better than its competitors. But nevertheless compared to them, it has an advantage--very simply, since it operates with a linear motor under a totally new principle. Ideas from the scientists of the Karl Marx Stadt Technical College and from our developers were implemented here. Not only does this motor move the carriage automatically, there are also many fewer parts; waiting time has been cut--the customer rewards this by purchasing it. It is thus not just a matter of conforming to predetermined limits. As much as possible we have to justify them with original solutions and produce these with high quality.

A Climate Which Leaves No One Behind

We are involved in these weeks in an admittedly difficult struggle concerning the fulfillment of the 1984 research plan and the preparation of the 1985 plan. The efficient use of cadres of specialists and the meeting of deadlines does not get easier when there are problems with supplies. Of course, this is true. But I do not consider it necessarily a truism: We--every one of us--must become more critical of ourselves, must not consider our own work as

successful and good a priority and become defensive whenever something which is personally criticial of us is said. On the contrary (and our contribution to the well-being of the people and the progress of the struggle for peace depends on this) we need a creative climate which benefits us all, leaves no one out, in which progressive and creative cadres flourish along with pride and joy in the results of success.

With such an attitude we can proceed to guarantee for this year and next year a renewal rate of 35 percent,

12666
CSO: 2302/33

ESER EC 1055 COMPUTER FOR CONTROL SYSTEMS RESEARCH

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 8, Aug 84 p 2

[Report from VEB Karl Marx Numerik, ESER Computer Center, Karl-Marx-Stadt]

[Text] On 1 May 1984 a youth brigade in the systems operation area was formed in the ESER Computer Center of the VEB Numerik Karl Marx in Karl Marx Stadt. Fourteen members of the FDJ work here. These young people fight for the title "35th Anniversary of the GDR." The general manager of the VEB Numerik Karl Marx, Comrade Dr Zugehoer presented the youth goal EC 1055 to the brigade. Under this designation the economical and effective installation of an ESER II computer must be realized during 1984. It will in the future be used to solve problems which will increase productivity, among others an efficient production facility for integrated circuit cards, a modular control-software development facility and rationalization of materials handling.

The ESER II computer, i.e. the central unit EC 2655 M, was delivered during the end of 1983. The computer was fully operational during the middle of January 1984, thanks to the outstanding quality work of the workers of the computer plant of the combine Robotron and the good socialist cooperative work between Robotron Installation, Customer Service of VEB Robotron Office Technology, BT Karl Marx Stadt, and our technical people from the ESER computer center. Based on this solid technical basis the following major tasks evolve for the youth brigade:

--SVM System, under which the DOS/1 ES and DOS/3 ES operating systems can run in parallel. Thus a changeover from DOS/1-ES to DOS/3 ES in 1984/85 is not required. The existing capacity will be useful for research and development tasks of control technology for the 1990's.

--Increase of the utilization of the facility based on generally multidisciplinary efforts. This obviates use of computer time in other computer centers. This will provide savings of M 600,000, as compared to 1983.

Within the general framework of the youth brigade a youth research collective has been set up. It set itself the task to find a microelectronic solution for the FD 478, which prevents overprinting of lines in case of torn paper.

The brigade contract also firms up the unity of professional and community work and cadre development, by a series of measures. An example is the election of a youth brigade member as deputy.

Focal point of workplace related continuing training for all young people is the development of skills in operating the SVM and DOS/3 operating systems.

All brigade members have pledged to give their best and to complete great and demanding tasks with zest and enthusiasm for the 35th anniversary of our republic.

7994
CSO: 2302/15

INSTITUTE DIRECTOR DISPUTES LACK OF RESEARCH EQUIPMENT

East Berlin WOCHENPOST in German Vol 31, 3 Aug 84 pp 4-5

[Interview with Prof Dr Werner Gilde, director, Central Institute of Welding Technology, Halle, by Horst Hoffmann and Heinz Mueller-Hanke]

[Excerpts] Our interview subject, Prof. Dr. rer. nat. habil. Dr. Ing. h.c. Werner Gilde is a member of the GDR Research Council and director of the Central Institute of Welding Technology in Halle. He was born in 1920, the son of a social-democratic mason, in the village of Horst, Schleswig-Holstein. Before and after World War II, during which he was a soldier, he studied chemistry at Goettingen where he earned his doctorate in 1947 and received an assistantship. A member of the SED since 1948, Comrade Gilde was at first responsible for quality control at Maxhuette Unterwellenborn and later on he was in charge of a division in the Hennigsdorf iron research institute. On 1 December 1952, at the age of 32, he was appointed director of the Central Institute of Welding Technology which he has been leading since then without interruption. In 1962, Dr. Gilde qualified as an instructor at the "Otto van Guericke" Technical College in Magdeburg; in 1968 he became a professor at the "Carl Schorlemmer" Technical College of Chemistry in Leuna-Merseburg. This "meritorious technician" and "hero of labor," holder of 60 patents, was awarded with the 2nd and 1st class national prizes for his research work. The internationally known expert published 200 scientific works and wrote 12 books, including four in the field of literature. The Japanese Society for Welding Technology elected him corresponding member. Prof. Gilde has been married for almost 40 years and has three daughters and seven grand-children.

Question: Your memoirs, which have now come out in the third addition, bear the rather melancholy title "Leben ohne Rueckfahrkarte" [Life Without Return-Trip Ticket]. What persuaded you to write that book which unfortunately covers only the first 3 decades of your life?

Prof. Gilde: Actually, in using this title, I only wanted to say that the land of my childhood and youth is behind me and that it cannot ever be brought

back. The final impetus for the book came from the questions of young people as regards the past. There are essentially two reasons for confining myself to the first phase of my life. On the one hand, many of the things I did or failed to do over the past 35 years go back to earlier times and cannot be understood without these roots. On the other hand, the closer they move to present times, the more difficult is it to describe experiences and their effects. The interval is simply too short.

Question: Are you satisfied as you look back over your life?

Prof. Gilde: Yes, I am satisfied. Most of my youthful desires have been met. I travelled over five continents; I experienced many interesting and funny adventures. But I also saw much poverty and misery. During the 4 decades of my work in metallurgy and welding technology, I created scientific studies which partly were decisive in the development of industry branches. I was able to contribute to the improvement of technology with some inventions. Often it was necessary to make decisions whose effects would involve figures in the millions. Over the years, I received a number of honors which I am very proud of. All in all, I was lucky enough mostly to do that which I liked to do. What more can you ask of life?

Question: So, you are one of those enviable people for whom job and hobby are one and the same thing.

Prof. Gilde: I hope that the same is true of you.

Question: Yes, but can you reveal to us how you handle the many demands which often make that difficult?

Prof. Gilde: I cannot stand it when some of our contemporaries rail against "those on top" and blame them for everything; but they do not improve themselves even if they could. For example, look at all of the nagging about bureaucracy which keeps growing everywhere, all over the world, at rising costs. We, at the ZIS [Central Institute of Welding Technology] said no when that became too much for us and at the same time submitted a proposal as to how to do the job in a simpler manner. That is a part of co-governing. And I must tell you that, in our state, you always prevail when you are dealing with a just and reasonable thing. The only thing is: You must not give up. Many who complain about their superiors in their eagerness completely forget that they could switch places of employment and even careers. Of course, one should not do that too often and one should never forget that things are pretty much the same everywhere. But anybody who is really unhappy with his job--even though he does good work--should switch.

Question: But you did not do that.

Prof. Gilde: Apart from the fact that this is my third enterprise, I changed my personal research direction several times over that long period of time.

I completely agree with Professor Manfred von Ardenne who is of the opinion that a scientist should change the main point of his work or the direction of his research about every 5-10 years. I did that once again just a short time ago by concentrating on the development of very cheap and particularly insensitive glues which are becoming increasingly important.

Question: What was your greatest success? What are you proud of most?

Prof. Gilde: Like anybody else, I am proud of that which came about through my achievement, the welding automat, which makes work easier in our industry and increases productivity, the licenses which we sold abroad. In the ZIS, we have one patent application for every approximately M100,000 research funds and each year we export several licenses based on patent applications. We have five staff members who have been awarded the honorary title "meritorious inventor." I am happiest when I get the feeling that I played a critical part in the development of an individual; when somebody, after many years, tells me, "I learned that from you" or "you gave me the inspiration for that at that time." Over the years, more than a dozen good professors have come out of our institute.

Question: What was your biggest disappointment or defeat?

Prof. Gilde: At the end of the 1950's, when we tried very hard to adopt semiautomatic powder welding from the Soviet Union--a fantastic thing. At that time we said quite truthfully: "If we can introduce this method in our country, then the welder's work will become considerably easier and he will no longer require such complicated training." But we were terribly wrong; although everybody complained loudly, nobody wanted any simpler training and easier work. This resulted in the failure of a technology which we had been so sure about, in other words, there were psychological mistakes during the introductory phase. That was a big lesson for all of my work thereafter.

Question: You have so far come out with more than 60 inventions for which patents were issued. That comes to an average of about two patents per year. Do you have a patent solution for that, if I may say so?

Prof. Gilde: This year I even have three already. You do know the proverb: "Whom the Lord gives a job he also gives the brains." I, so to speak, slithered into the inventor's career. I set myself my first challenge during the year our republic was founded. The iron girders, which we were making at that time in MaxhuetteUnterwellenborn, were so brittle that they broke like glass when they were unloaded from the railroad car. It was my job to find out why the girders broke and what had to be done to increase their elasticity. I learned how to think positively in solving this problem. Or, let me give you another example: For the first passenger vessels, which our shipyards delivered to the Soviet Union, we needed rust-proof steel both for the turbine blades and for the flatware. But none of us knew how one could make that in the big furnaces at Maxhuette. I worked hard and I found a way. I still have a complete set of table silver in my possession, made in what at that time was the Auer Flatware Factory, which I received as a reward.

Question: What, in your opinion, makes a successful inventor?

Prof. Gilde: Talent and luck, inspiration and perspiration. If they all come together, then you can implement our institute's mottos: "It is your duty to be successful! Invent that which has never existed before." Creativity in any case require a political attitude: Being creative, basically, is a personal life concept for which we have all prerequisites.

You will certainly have had the experience yourself that the process of finding ideas often takes so long because our attitude in that direction often leads much to be desired. Children, who say something unusual, are often laughed at; the healthy curiosity of young people is somewhat rather quickly dismissed as a "stupid question" or "as being irrelavant"; every adult, who expresses an unusual, "crazy" idea, exposes himself to the danger of being misinterpreted. This is why a brake in our brain prevents us from thinking too much about new things. Every child should be urged as often as possible to ask "dumb questions" and to express "fixed" ideas. Only he who dares ask questions--even though the stupid people may laugh at him--has a good chance of becoming a researcher.

Question: In what way do the working conditions of a scientist along the banks of the Saale River differ from those of his colleague on the Rhine or the Ruhr or in California or on Honshu?

Prof. Gilde: There are very few industrial countries in the world where research is being promoted as much as in the GDR. I would even go further and say that there is hardly any other national science, as a whole, which is as well-equipped as the one in the GDR. After all, we have everything we need and nobody is being restricted in his work. That naturally obligates the researcher to come up with top-level achievements and that should cause us to handle science in a manner similar to performance sports where we consider it quite natural to replace those athletes who do not come up with top-level achievements.

Question: But there are complaints on occasion that one or the other modern instrument is lacking. What do you say to that?

Prof. Gilde: Apart from the fact that so far every institute has received the instruments really needed for its research work, I am of the opinion that there is still too much false pride in this field. I know, for example, that requests for the purchase of Japanese electron-beam microscopes are lying around in the office of the minister of science and technology. We relinquished an instrument of this kind because we cannot make full use of it. If we absolutely have to study something, then we go to the Halle Weinberg where we have our academy's Central Agency for Electronmicroscopy. The most important thing in research after all is not the equipment but rather the spirit. And we do not have to import intelligence; it is present in the republic in sufficient quantity. At the ZIS, for example, we are working on controls for robots. Now, we could say that, without certain

structural components from abroad, we cannot build them. But we do take parts, which we have in the GDR and we change the software so that we can obtain our goal. Software, in otherwords, program technology, however is something purely mental. For that, you have to have a bench to sit on in your garden, a piece of paper, and a pencil for writing and drawing and you also need your head for thinking.

Question: Do you see any contradiction between the freedom of research and the planning of science?

Prof. Gilde: No. The freedom of research, I believe, is contained in the planning of science. Specifically, one can only plan that which is known in advance. Columbus knew that the earth is a sphere and, sailing to the west, he planned to reach India. What he was unable to suspect and plan was that he would discover America in the process. Naturally, nobody can order that a certain invention be made by a certain deadline. But one can plan with a high degree of probability that qualified experts will figure out one or more solutions to any problem.

Question: Is the GDR internationally competitive in the field of welding technology?

Prof. Gilde: When we founded the ZIS, the GDR imported welding-technology equipment; today we export equipment and licenses in this field.

Question: What criteria are you establishing for the scientist's responsibility in our day and age?

Prof. Gilde: We researchers live on the moral and material credit which society grants us. This is why we have a great responsibility and we feel that we must account to the people for our work. In my opinion, a scientist's responsibility for his field is indivisable. It equally encompasses the theoretical and experimental foundations, in other words, research, which are to yield immediate benefit and the introduction of new developments into production. In this way he contributes to the growth of the republic and to the preservation of peace.

Question: Do you already have a successor, Comrade Gilde?

Prof. Gilde: For the past 2 years I have tried to introduce my successor to my job--also as far as the higher echelons are concerned. He is in his 40's and has a long way to go yet.

I will be 65 next year and I will stop working here. I would not like to be in a position like one of my former bosses. He stayed on the job until he was 75 and deprived the younger staff members of a good place. At that time I swore that I would act differently some day.

The Central Institute of Welding Technology in Halle

The ZIS was founded in 1952 and is the scientific-technological center of the GDR regarding all tasks in welding technology, soldering technology, and

thermal separation. The main points of research and consultant activity also include the development of robots. Among the approximately 500 employees, 180 are scientists and engineers and 200 are skilled workers. The ZIS works with 2,500 welding enterprises, 125 welding equipment makers, and 40 institutes and colleges in the GDR, as well as 80 organizations abroad. In 1983, 40 new equipment items and 800 new technologies for practical use came out of Halle. The staff members came up with 120 inventions and 80 of them were covered by patent applications. They furthermore published 80 scientific works, they handled 1,200 job assignments in enterprises and they conducted 5,000 consultation sessions for industry. Basic and advanced training now is given to 20,000 welders in enterprises with ZIS license, as well as more than 3,000 specialists and engineers.

The ZIS sells licenses, among others, to Belgium, the FRG, Bulgaria, Japan, Austria, Poland, and Sweden. The confirmed benefit from industry annually amounts to more than M50 million. For every Mark spent on research, we were able to earn M7 in terms of benefit to the national economy.

5058
CSO: 2302/23

CLOSER COORDINATION OF BASIC RESEARCH WITH INDUSTRY URGED

East Berlin PRESSE-INFORMATIONEN in German No 104, 6 Sep 84 pp 2-3

[Interview with Prof. Dr Werner Scheler, president, GDR Academy of Sciences]

[Text] Why is basic research as a source of new knowledge so important for our social development and for science itself?

As Erich Honecker stated at the 10th party convention of the SED, "all serious and far-reaching progress in the development of the modern productive forces now and in the future has its roots in scientific discoveries." Basic research bears a special responsibility in this respect because it opens--taking the unity of the sciences as a point of departure--through new insights into the laws of nature and society, new possibilities for using and controlling natural processes. It was, for instance, only possible by an analysis of the nucleic structure of the genetic material, by deciphering the genetic code, and by numerous other fundamental results of the molecular and cell biology, to bestow new properties and productive powers to organisms. The work performed in quantum electronics during the fifties led to the development of the laser technology and its wide use in the national economy and other areas of society.

The number of samples could be increased at random. New knowledge always stands at the cradle of new products, technologies and processes. Frequently, however, the effects on production, the social conditions, and on the living conditions of the individual are in no way always recognizable from cause to effect when new ground is broken in science or work is started in basic research. It is necessary, of course, for basic research to orient itself towards the present and recognizable perspective requirements of our society and this is indeed the case. At the same time we are aware of the fact that the research also stimulates and creates new needs and that a dialectic correlation exists consequently between science, production, and social needs. We are meeting these needs with the long-term development of basic research, its close integration within the framework of overall state planning of science and technology, and by the cooperation with ministries and combines.

Teamwork in numerous economic disciplines is of decisive importance especially in basic research which turns its attention to very complicated and multifacetted problems. In microelectronics, for instance, optimal performance

is required in many areas of physics, chemistry, mathematics, engineering and in the social sciences in order to control this complex technology, as well as its social effects and conditions.

Cooperative action is necessary especially also for the cooperation of the socialist countries. This serves the purpose of performing the widest possible spectrum of promising research studies by a division of labor, and of utilizing the science potential in a more effective manner.

To what extent do the results of basic research lead at present to new processes and products? How effective are those of the Academy in practice?

"Theory without practical application is fruitless and practical application without theory is blind." With this often quoted sentence, Bernal has strikingly characterized the dialectic correlation between basic research and its practical application. We view research, technology and production as a uniform process whose interaction and speed of development are influencing and shaping the full development of the socialist economy of our Republic.

We are guided by it in determining the research profile and tasks assigned. It is necessary for this reason to establish and promote close, coordinated cooperation of natural, technical and social scientists in such fields as flexible automation, the effective utilization of microelectronics, the safeguarding of the energy base and the like, for the purpose of advancing original solutions of principles to economically bearable results for practical application. In view of the wide division of labor beginning with the invention or discovery up to large-scale production, it does prove difficult if not impossible to exactly evaluate the benefit of basic research, if need be even by only a single criterion, perhaps the value of the effected production of goods. The inventions and patents are a certain standard for us. They increased from 560 inventions in 1981 to over 800 in 1983. Beyond that, the results of the research conducted by the Academy flow through many channels into industrial development.

Notwithstanding all progress made, it is imperative to further consolidate the economic and overall social effectiveness of academic research, particularly since the growing requirements of the political and economic development of socialism and the rapid progress of knowledge on the international level confront us with constantly bigger tasks.

Will the scientists of the Academy succeed in decisively increasing the economic weight of basic research?

Since basic research acts as a preliminary stage of applied research and technical development, it is, as stated above, one of our concerns to constantly increase the potential economic weight of its results. This is demonstrated, for example, by a feat, such as the development of a new catalyst on the basis of studies conducted on the principles of structured properties of catalytic multi-metal domains. Its application in the chemical industry of the GDR results in an annual gain of many million marks.

We are endeavoring to impart from our many years of research new impulses for the acceleration of industrial development. This applies, for instance, to the digital transmission of signals and their application in high-grade electronic consumer goods or to the upgrading of materials by means of laser beams. We were hereby increasingly successful in attaining research results conforming to the growing economic requirements for securing a continuous development of our national economy. Our research was especially productive in areas which are decisive for the pace of progress in science and technology. We created for ourselves in this regard better starting positions by carefully orienting our research with respect to content and potential. The Academy endeavors to increase the degree of technological maturity of its results within the framework of its possibilities in order to facilitate their faster economic utilization. Today the time factor plays a major role in the economic effect attainable. This requires a close interaction between research and production. Understandably, the Academy is not in a position to mass-produce products it has newly developed. We are attempting, though, wherever possible to help meet the most urgent demand through temporary production in the lab until mass production has been started by industry. We see one of the possibilities of accelerating the transfer of results of the Academy research into production in offering-exchanges--as recently in Berlin--or in user-conferences to which we are inviting the representatives of the combines. I would also like to mention the multitude of consultations, experimentally substantiated reports, opinions and studies made available to our partners engaged in practical application.

Representing the results of the research conducted in the social sciences, I would like to refer to the numerous scientific events organized and publications issued on the occasion of the Karl-Marx Year and the Luther Jubilee, making effective contributions to the deepening of historical awareness and ideological discussions.

At first glance, basic research has little to do with patents.

On the contrary, basic research is the source of new knowledge in the natural sciences and technology. True, many new insights into the laws of nature are not patentable, but if original discoveries lead to technical solutions ready for practical application, they constitute inventions embodying considerable innovation potential. Patent applications should be filed for and protection extended to such results, for their national economic effect can extend far deeper and farther, for instance, than that of inventions of a very special product development.

Almost half of the more than 800 inventions worked out by members of the Academy alone or in collaboration with partners in industry, for which patent applications had been filed in 1983, result from tasks of basic research. These are comprised, among others, of processes and products, such as the synthesis of synthetic hard materials, the creation of processing bases for the high-gradient magnetic separation, the development of an optical modem, as well as a flat bed plotter or the ergotropic nourseothricin. In the year 1983, 54 inventions of the Academy of Sciences were introduced for practical use. The inventions of the Academy utilized in the national economy of the GDR yield many millions of mark in economic gain every year. As I have already pointed

out, however, we are still not satisfied with our achievements. This is especially true with regard to inventions of a technological system character.

What relations exist between the basic research of the Academy and the combines? How have the scientists utilized these possibilities to date?

The collaboration of the Academy with combines and production enterprises of the national economy and a number of other state facilities is of fundamental importance for us. Practical application is a source of important impulses for new research tasks in the natural sciences and social science disciplines. The basis of the relations to industry is the joint working out of promising objectives and long-term strategies. Diverse and fruitful work contacts have developed over the years. These extend from consultations on economic action in scientific bodies and councils to the work of joint research collectives.

The Academy has to create first of all a disciplinary and interdisciplinary lead in the economically important areas. It can accomplish this all the better, the more efficient the research and development potential is in the combines themselves, including an independent basic research of industry conducted according to specific branches. According to our experience, this is an indispensable prerequisite for the daily functioning of productive cooperation. Scientists of the Academy are, of course, also using collaboration with industry for the purpose of perfecting their knowledge especially in the areas of technology and industrial management, just as the scientists in industry are provided in our laboratories with manifold information, methodical knowledge and suggestions for their activities. In this way, mutual understanding is promoted for the problems and possibilities of the partner. This is also significant for the Academy, since it can resort to using experimental and test facilities, as well as other technological potentials of the combines. We are at the same time expanding the technical/technological capacities in our facilities, such as technical training schools and the like. Our experience has shown that facilities having at their disposal efficient technical schools and technological laboratories for years, exhibit a higher national economical effectiveness of their scientific basic research than those which did not have such a base of their own till now.

12693
CSO: 2302/12

NEW YES 1056 UNIFIED SYSTEM COMPUTER MODEL DESCRIBED

Operating System, YeS 2156 CPU

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 21 No 8, Aug 84 pp 5-7

[Article by Christoph Weber, Wolfgang Lampenscherf, Karl-Heinz Homilius, VEB ROBOTRON Combine, Karl-Marx-Stadt]

[Text] In September 1984, the Robotron Combine VEB development group will redeem its pledge in honor of the 35th GDR anniversary to perform joint testing of the latest GDR Unified System computer model: They will defend the result of their development as the GDR contribution to the "6th" series of Unified System computer models before a committee of experts from the countries participating in the Unified System.

The YeS 1056 ends a phase in model development in which, starting with the Yes 1055 model, a number of improvements have been implemented step-by-step. This development was aimed at clearly improving both applications and manufacturing efficiency and at introducing the latest research and development results into practice as quickly as possible. A new operating system and steps taken in the CPU to increase performance have raised throughput substantially. A considerable contribution to saving materials and energy has been made with the reduction in use of copper (43-percent), aluminum (30-percent), ferrous metal (40-percent), dynamo sheet metal (90-percent) and energy consumption (50-percent) in the CPU. Operator and engineer conveniences have been markedly improved by the introduction of the Yes 7069.M operator and service processor. A continuous model inventory effort has led to expansion of the designated model inventory to over 60 types of devices. The totality of these improvements represents a new quality--the Yes 1056 model.

The Operating System

The main YeS 1056 systems are the operating systems in the newly developed OS-7YeS operating system complex. However, the YeS 1056 is also supported by the ninth modification of OS-6.1YeS.

Since OS-7YeS is covered in detail in [1], we will mention just the key points here. The OS-7YeS complex includes these operating systems:
--SVM 3.0,
--BPS 7.0,
--SVS 7.0.

SVM 3.0 replaces SVM/YeS. It is upward compatible with versions 1 and 2 of SVM/YeS. Compared to the latter, SVM 3.0 has been expanded with additional functions. Also, steps were taken to raise the efficiency of operation of the PTS [programming and test system] and the operating systems with their own virtual storage in virtual machines. SVM 3.0 efficiency has also been increased by special microprogram assists implemented in the YeS 2156 CPU.

BPS 7.0 implements batch processing on SVM virtual machines (V=V). The range of batch processing functions available is similar to those in the eighth modification of OS-6.1YeS.

SVS implements batch processing on real or virtual machines (range of functions is similar to those in the eighth modification of OS-6.1YeS). SVS 7.0 also contains a number of major functional expansions and solutions to raise performance.

OS-7YeS has a fully generated sort/merge program which operates under control of BPS and SVS.

OS=7YeS includes the PL1, COBOL, FORTRAN and PASCAL programming systems which consist of several compilers, compatible with each other, for optimizing or test purposes with the appropriate run-time libraries. These systems can be used in all OS-7YeS operating systems. Upward compatibility is maintained for applications programs.

KPTO [Hardware Maintenance Program Complex] Components

These components of the Hardware Maintenance Program Complex (KPTO) are available for the YeS 1056:
--DMES test program system which enables testing of the CPU and peripherals independently of the operating system,
--OLT test program system which enables testing of peripherals independently of the operating system or under control of SVM/YeS or by using the control program for device testing (OLTEP) [on-line test executive program],
--system test program (SYP/YeS) which supports quick testing of the working order of the YeS 1056 hardware,
--micro diagnostic system for the CPU and individual peripherals which along with the hardware checking and diagnostic facilities and the test programs listed above support placing the machine into operation, complete testing and optimal fault localization for YeS 1056 TM [Test under Mask].

YeS 2156 CPU

The table shows the major parameters for the YeS 2156 CPU.

Table of Main YeS 2156 CPU Parameters

Operation speed (according to CEMA standard 2098-80)	505,000 op/s
Instructions	188
Machine cycle	380 ns
Main storage	2 or 4M bytes
Channels:	max. 5
block multiplexer	max. 4
byte multiplexer	max. 2
Maximal transfer rate:	
block multiplexer channel (with 1-byte interface)	1.7M bytes/s
(with 2-byte interface)	3.4M bytes/s
byte multiplexer channel (burst mode)	1.7M bytes/s
(multiplex mode)	40K bytes/s
overall transfer rate, greater than	10M bytes/s
Control storage: fully loadable	
size	10K micro instructions
word size	64 + 2 bits
Cabinets (without matrix module)	2
Area	1.8 m^2
Power draw	4 kVA

The YeS 2156 CPU is upward compatible with the YeS 2655.M CPU with respect to its functional properties relevant to the applications programmer. Six new instructions have been added to the YeS 2156 CPU instruction set. Five of them are used solely to increase SVM/YeS operating system efficiency. The sixth instruction is available to the applications programmer: The instruction Move Inverse (opcode E8, mnemonic MVCIN, SS format) moves a field of up to 256 bytes with inversion of the byte sequence from one main storage location to another.

The YeS 2156 CPU speed of operation according to the instruction mix method defined by CEMA standard 2098-80 generally used for rating Unified System CPU speeds of operation is:
--in running scientific and technical jobs: 505,000 op/s with single-length operands or 445,000 op/s with double-length operands
--in running economic planning jobs: 250,000 op/s.

Since the instruction mix for this method does not realistically take into consideration the frequency of the instructions occurring particularly in the operating system operation, a SYSTEMMIX was suggested in [2]. Using the SYSTEMMIX, the speed is 538,000 op/s.

Based on comprehensive analysis of the instruction spectrum and typical application characteristics of the instructions in operating systems and applications programs used in Unified System CPU's, the execution of a number of instructions was speeded up. Thus, for example, the execution times of the following instructions, compared to the YeS 2655.M, have been reduced by factors in the range from 1.3 to 3:
Load and Store Multiple (LM, STM),
Insert and Store Character under Mask (ICM, STCM),

Compare Logical (CLC, CLI, CLCL, CLM),
Test under Mask (TM),
Move Characters (MVC, MVCL)
And, Or, Exclusive Or (NC, OC, XC),
Multiply Decimal (MP),
Execute (EX)
Translate and Test (TR, TRT),
Monitor Call (MC)
Supervisor Call (SVC),
Load Program Status Word (LPSW),
Set System Mask (SSM),
Store and And/Or System Mask (STNSM, STOSM)
Load Real Address (LRA),
Load and Store Control Register (LCTL, STCTL), and
the clock and timer instructions (SCK, STCK, SPT, STPT, SCKC, STCKC).

To speed up program processing under control of SVM 3.0 in OS-7YeS, a microprogrammed assist of the control program has been implemented in the YeS 2156 CPU (a description of the principles of operation of such a microprogrammed assist is given in [4]). Program processing time is about halved by this microprogrammed assist (compared to processing without it).

This microprogrammed assist is also used in the SVM/YeS operating system described in [3].

The microprogram assist of the control program implemented in the YeS 2156 includes these complexes:
--basic assist for operation of virtual machines,
--extended assist for operation of virtual machines,
--control program assist,
--virtual interval timer assist,
--assist for operation without shadow tables.

The basic assist for operation of virtual machines supports execution of these privileged operations (in the real problem state):

LRA	Load Real Address
STCTL	Store Control Register
RRB	Reset Access Bit
ISK	Insert Storage Key
SSK	Set Storage Key
IPK	Insert Protection Key
SSM	Set System Mask
STNSM	Store and And System Mask
STOSM	Store and Or System Mask
LPSW	Load Program Status Word
SPKA	Set Protection Key of Addresses

The basic assist also allows execution of SVC operations in the virtual machines for operation of virtual machines without requiring the SVM control program to be active. In the process, a microprogram implements the SVC interrupt for the active virtual machine. Another special function of the

basic assist allows handling program exceptions (page fault) which can occur during the operation of virtual machines.

The extended assist for operation of virtual machines is a functional extension of the basic assist and can be activated only together with the latter.

The function spectrum implemented for the YeS 2156 includes additional support for some operations already supported by the basic assist (LPSW, SSM, STNSM, STOSM) and microprogram hardware handling of four other privileged instructions:

STPT	Store CPU Timer
TCH	Test Channel
SIO	Start I/O
SIOF	Start I/O Fast Release

While the STPT and TCH operations are fully handled by the extended assist, there is partial support of the SIO, SIOF, LPSW, SSM, STNSM and STOSM operations by the extended assist in a microprogrammed initialization of software simulation of these operations by the SVM control program. The operations mentioned as already supported by the basic assist (LPSW, SSM, STNSM and STOSM) are further handled in those cases in which the basic assist would report a program exception (privileged operation) because of a detected special condition. At the end of this handling, control is transferred directly to an SVM routine.

The control program assist includes a number of new privileged operations with the E6 opcode (SS instruction format) which are identified by subcodes in the second operation byte. The functions of these operations contain the logic functions of sections of certain SVM 3.0 routines which are used frequently. The control program assist is activated when bit 6 in control register 6 is set to 1. When the extended assist is activated (bits 0 and 6 in control register 6 are set to 1), the control program assist complex is consequently activated too. The two operand addresses of the E6 operations in general mark the beginning of a data list and an exit list, respectively. These lists contain data/addresses which are used as operands during execution of the operations. As a rule, the sections of the control program routines whose functions implement the E6 operations follow the E6 operations in the SVM program text.

With the virtual interval timer assist, precise interval timer values can be made available to those programs which are processed on virtual machines. The virtual interval timer value is always updated when the real interval timer value is updated during the operation of the pertinent virtual machines. To activate the virtual interval timer assist, bits 0 and 7 of control register 6 must be set to 1. The address of the virtual interval timer value is made available by the SVM control program in the field MICVTMR of the MICBLOK. This real address points to either location X'50' in page 0 of the virtual machines or to the timer word VMTIMER in the pertinent VMBLOK. The latter address is used when page 0 of the relevant virtual machine has been paged out at the time of the timer update. When the value of the virtual interval timer is negative during the update (subtraction of a 1 from bit position 23 of the

timer value), the virtual interval timer assist signals a real external interrupt with the interrupt code X'0100'. Other external interrupt requests (real interval timer, attention key, external signals) can be sent together with this interrupt condition can. The virtual interval timer assist is always activated together with the basic assist.

The assist for operation without shadow tables is used to increase performance of virtual machines for which V=R (virtual=real) has been specified. In the YeS 2156, the assist for operation without shadow tables supports these operations:

LCTL	Load Control Register
LRA	Load Real Address
PTLB	Purge Translation Lookaside Buffer
STNSM	Store and And System Mask
STOSM	Store and Or System Mask
PFR	function for handling of page faults

For the execution of functions of the assist for operation without shadow tables, the proper contents of control register 6 and the adjustment of control field MICACF in the MICBLOK are required in addition to the real problem state. Some of the operations supported for the operation without shadow tables (LRA, STNSM and STOSM) are already supported by the basic assist. In the process, the assist for operation without shadow tables has the higher priority. Page faults which occur during the operation of V=R machines are fed directly to the relevant virtual machines by the PFR function.

The microprogrammed assist of the SVM 3.0 control program is always ready for use in the microprogram storage in the YeS 2156 CPU. It is transparent to the applications programmer.

The YeS 2156 CPU microprogram storage has a capacity of 10K micro instructions of 64 + 2 bits each. It is fully loadable. It holds at the same time the microprograms for implementing the CPU instruction set and standard functions, the microprograms for operation with the array module, the microprogrammed assist of the control program described above and the DOS emulator microprograms. This capacity eliminates the necessity of alternately using either the microprogrammed control program assist or the array module as with the YeS 2655.M and unproductive conversion time from microprogram storage reloading. The microprograms are initially loaded from a diskette storage unit in the operator and service processor when power is turned on or as a result of an appropriate operator function. The entire microprogram storage is also loadable from main storage by using a special modification of the diagnostic instruction. The capability of loading microprogram storage is used within special diagnostic runs (CPU and matrix module micro test, diagnostic instruction) through reloading of micro instructions.

The YeS 2156 CPU has a maximum of 4M bytes of main storage. It can be equipped with 2 or 4M bytes made up of U 256 16K-bit MOS memory circuits.

The YeS 2156 CPU I/O unit has up to five channels in these alternatives:
--2 block and 1 byte multiplexer channels,

--3 block and 2 byte multiplexer channels,
--4 block and 1 byte multiplexer channels.

A channel-to-channel adapter for faster data transfer between two CPU's is optional. Data transfer rates for this adapter are up to 1.7M bytes/s with the 1-byte interface and up to 3.4M bytes/s with the 2-byte.

The YeS 2156 CPU I/O unit has a configuration facility which allows assigning, for each channel, any device address to a nonshared subchannel or groups of 8, 16 or 32 each of consecutive device addresses to a shared subchannel. The configuration facility also enables, for groups of 8 each consecutive device addresses, inhibiting the block-multiplexing mode determined by the channel type and the status of the block multiplexing control bit (bit 0 in CPU control register 0) existing at initialization of an I/O operation. The configuration facility eliminates the rigid (hardwired) assignment of subchannels to device addresses implemented in earlier CPU's. Since the configuration facility is controlled by the operator and service processor and the subchannel configuration is adjusted, changed and displayed by using a special operator frame, the configuration of the subchannels and the operating mode of the block multiplexer channels can be flexibly and conveniently adapted to the corresponding operating requirements of the external devices which is particularly important when changes are made to the device configuration.

The YeS 1055.C003 matrix module, the high-performance specialized arithmetic unit developed earlier for the YeS 2655.M, is available as an option for the YeS 2156 CPU. The principles of operation and interface [5] for it have been retained. The matrix module is also supported in OS-7YeS.

The YeS 7069.M Operator and Service Processor, designed as a standalone device, is used by the operator to control the YeS 1056 and by the maintenance engineer for communication. Since all operator functions for the YeS 2156 CPU are implemented by the operator and service processor, there are no operator controls on the CPU. The principles of operation for the operator and service processor are described in detail in [6].

The YeS 2156 CPU consists entirely of 2 + 1 cabinets. One holds the logic (including main storage and the I/O unit), another houses the power supply, and the third, the matrix module and its power supply.

BIBLIOGRAPHY

1. EDV-ASPEKTE, Vol 3, No 3, 1984.

2. Mueller, Dr. D., "On the Problem of Global Performance Figures within Computer Families," in "Wissenshaftliche Informationen und Berichte Nr. 23" [Scientific information and Reports, No 23], VEB Robotron Zentrum fuer Forschung und Technik [Research and Development Center], 1984.

3. Lampenscherf, Dr. S.; Schroeder, A. and Wagner, K., "System of Virtual Machines (SVM/YeS)," RECHENTECHNIK/DATENVERARBEITUNG, Vol 18, No 2, Feb 81, pp 22-27.

4. Lampenscherf, W.; Linzmann, D. and Otto, H., "YeS 2655M CPU," RECHENTECHNIK/DATENVERARBEITUNG, Vol 18, No 2, Feb 81, pp 2-6.

5. Geissler, R; Riesen, M.; Seifert, F.; Gruner, Dr. R. and Wendlik, K., "Matrix Module," RECHENTECHNIK/DATENVERARBEITUNG, Vol 18, No 2, Feb 81, p 32.

6. Marschner, R., "YeS 7069.M Operator and Service Processor," RECHENTECHNIK/DATENVERARBEITUNG, Vol 21, No 8, Aug 84, p 8.

YeS 7069.M Operator, Service Processor

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 21 No 8, Aug 84 pp 8-12

[Article by Rainer Marschner, VEB ROBOTRON Combine, Karl-Marx-Stadt]

[Text] The YeS 7069.M operator and service processor (BSP) is intended for YeS 2156 CPU system operation and maintenance. It is an improvement of the YeS 7069 console with more modern components and considerably expanded operating aids and functions tailored especially for the YeS 2156 CPU. The YeS 7069.M is a modular individual device based on a multi-microcomputer system with two displays, two disk drives, serial printer and keyboard. The YeS 7069.M design is described in detail in [1].

The YeS 7069.M handles a complex of tasks for operator communication with the system (through the standard interface) in the typewriter mode, display mode and unbuffered printing which can run simultaneously with two displays and a serial printer. This also allows simultaneous execution of maintenance and system operations, i.e. analysis and checking of CPU information and peripheral maintenance (with test sections which run under operating system control) during normal system operation, or distribution of operating system messages to the two displays.

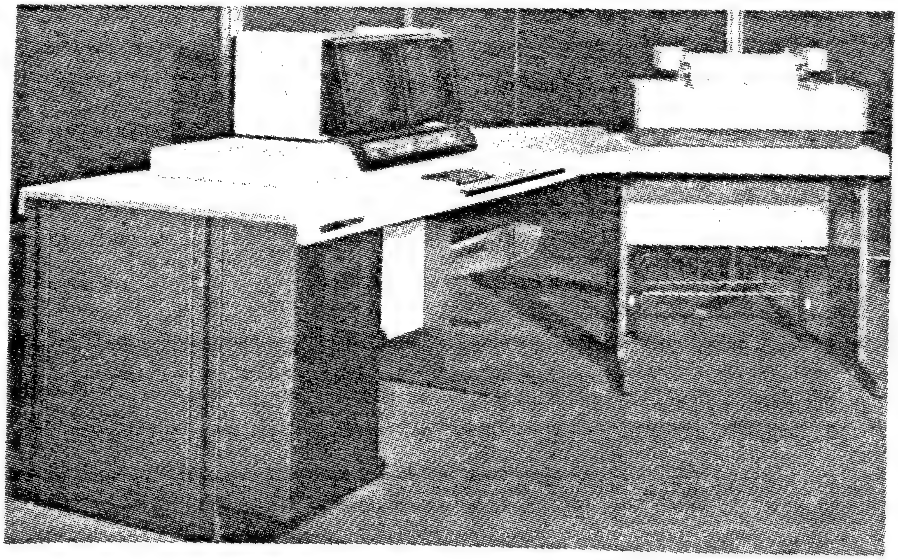
General Information

CPU control, diagnostics and maintenance is enabled by the special interface. For this task complex, there are 18 operator frames (when the matrix module (MAMO) is connected, there are an additional 9 operator frames for the CPU). There are also 124 help frames which can be called up to display text information for the operator and maintenance engineer.

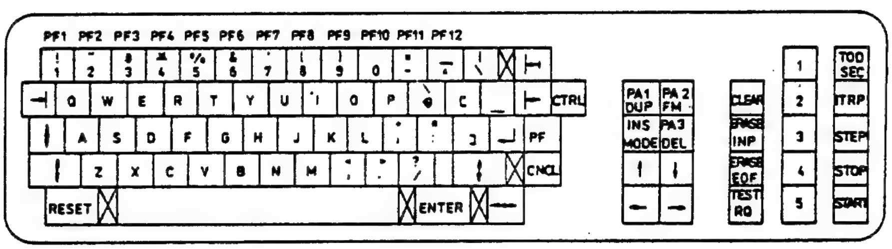
Logical addresses can be entered in displaying the contents of main storage.

The YeS 7069.M allows adjusting cursor presentation (underline, intensive, inverse, blinking and combinations of them) and volume of audible alarms. For the YeS 2156 CPU, the I/O system configuration can be adjusted (shared subchannel, block multiplexer operation) and processor device configuration is flexible. All adjustments and configurations can be stored on diskettes and thus are available when the equipment is turned on again.

The YeS 7069.M is used for initial microprogram loading (IML) of the CPU. Since this information is read from a diskette, a new microprogram release can be introduced at any time.



YeS 7069.M Operator and Service Processor (BSP)



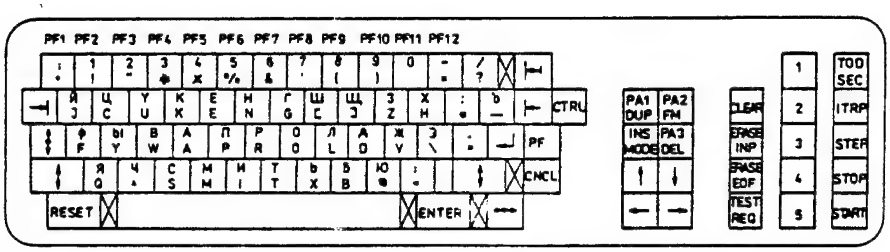


Fig. 1. [top] Latin keyboard Fig. 2. [bottom] Cyrillic-Latin keyboard

High reliability of the device is ensured by the components used (LSI circuits) together with on-line fault detection, error correction during diskette access and automatic restart in event of an error.

The comprehensive capabilities of the self-diagnostics and fault localization and processor design allow faults to be located rapidly.

YeS 7069.M Design

The YeS 7069.M is a multi-microcomputer system based on the U-880 which allows connecting peripherals such as the keyboard, maintenance and operator's control panels, serial printer, displays and disk drives and equipment which enables communication with the CPU (standard interface adapter, special interface adapter) [1]. The processor is a workstation with seats which is structurally housed in an enclosure in the standardized enclosure series (see photo).

Used with the YeS 7069.M is the Robotron K 7608 keyboard, available in two models:
--Latin keyboard (Latin capital and small letters) (see fig. 1)
--Cyrillic-Latin keyboard (Cyrillic and Latin capital letters) (see fig. 2).

A switch allows using either keyboard without further alteration to the hardware or control program for the operator and service processor.

Key assignments correspond basically to the YeS 7920.M video display system (described in [2]).

Several special keys and features are also available. Thus, the PF keys (program function keys for the display mode) are implemented by holding the PF key down and pressing one of the first 12 keys in the top row. The CNCL (cancel) key has the same function as the PA2 key (erase the entire screen except the input line). The CTRL (control) key is used to switch between a program frame and operator frame. The <-+-> key controls the assignment of the keyboard to a display (switching function). The TOD SEC, ITRP, STEP, STOP and START keys correspond to those used for the YeS 7069 operator console [3].

A 4-key rollover is used for the keys, i.e. up to four keys can be held down at the same time. The function test occurs after the sequence of activation (several keys, RESET, CTRL, <-+->, dominate over the rollover).

Also, the repeat function is implemented for all alphanumeric and cursor keys: When a key is held down over 0.6 s, the function is repeated (about 10/s). A repeat function for the start key can be adjusted through frame B5.

The operator control panel is located below the displays. It contains the controls specific to the system and processor (fig. 3) used for power on/off and emergency off, local/remote switching, ON/OFFLINE switcning and which connect the processor through the special interface (SPIF) to the CPU (CONNECT switch together with the NOT CONNECTED indicator light).

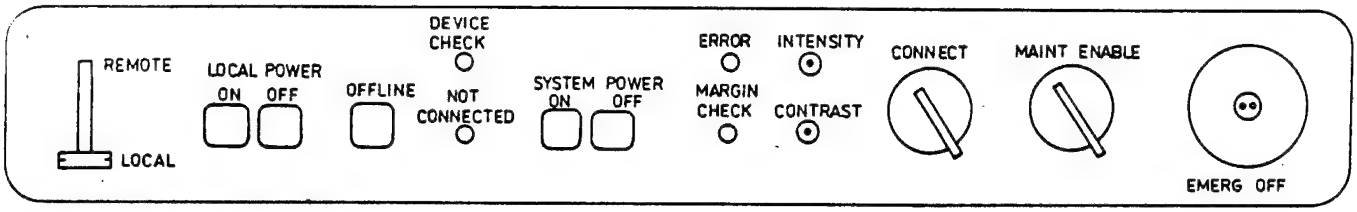


Fig. 3. Operator control panel

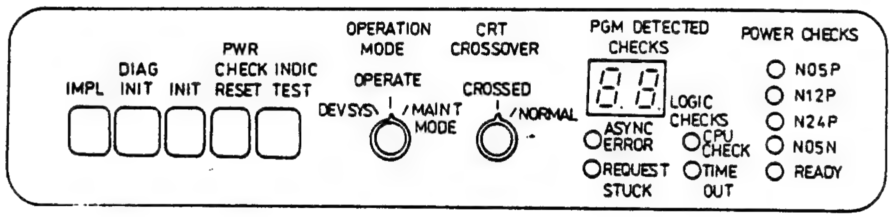


Fig. 4. Maintenance control panel

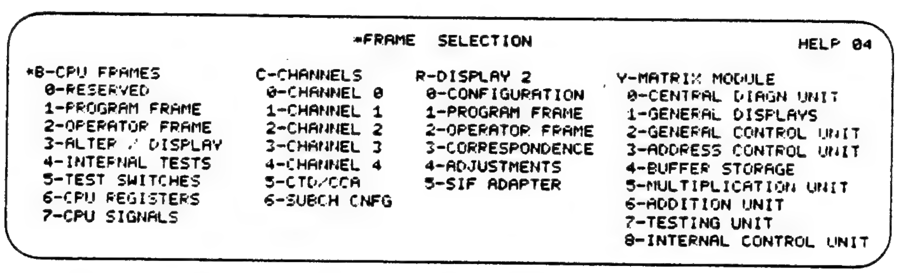


Fig. 5. Help screen 04 (processor frame selection)

The DEVICE CHECK light indicates a fault within the processor; when the ERROR indicator light is lit, the power on sequence has not yet ended, or there is a CPU power supply fault; MARGIN CHECK indicates the CPU power supply has exceeded the margin value.

INTENSITY and CONTRAST are used to control the display. MAINTENANCE ENABLE is used to switch to the CPU maintenance mode in which the CPU machine step can be altered and a CPU IML (initial microprogram load) can be initiated.

The maintenance control panel is covered. It has five push buttons to control the processor, a display switch (CROSSOVER), a two-position 7-segment indicator for internal processor failures, four LED's indicating specific processor failures, and five LED's indicating faults in the processor power supply (fig. 4).

IMPL Button: used for complete processor reset and loading of the processor operating program (processor initial program loading).

DIAG INIT Button: used for complete processor reset, execution of all internal processor tests and subsequent initial program loading of the processor.

INIT Button: used for complete reset of processor.

PWR CHECK RESET: used to clear power supply checks.

INDIC TEST: used to test processor indicators.

Operation Mode Switch: MAINTENANCE MODE is used to call the processor maintenance system; OPERATE is used for the processor normal operating state; and DEVSYS is used to load the normal processor operating programs, but without starting the programs.

The YeS 7069.M processor uses the Robotron 1154 serial printer with 132 characters printing width and 45 cps continuous printing speed for a log printer. The displays display 80 characters per line and 24 lines on the screen [1]. The YeS 7069.M has two MF 3200 diskette drives. Both hard- and soft-sectored diskettes can be used on the processor. A special recording format allows 4K bytes of user information per track. Error correction handles 1-bit errors during reads (up to 5 x 128 per track, clustered errors too). Two-bit errors are displayed.

Two diskettes are used to operate the processor (the processor program diskette and the CPU microprogram diskette). For reliability when one drive is inoperative, the diskettes can be read in consecutively with one drive.

Power On Sequence for the YeS 7069.M with the YeS 2156 Connected

To ensure maximal functional reliability of the processor as the operator console for the YeS 2156 CPU (particularly with respect to reading in the CPU IML microprogram), the entire processor and devices connected to it are checked when the "power on" or DIAG INIT buttons are pushed (see section on YeS 7069.M design).

When the SYSTEM POWER ON button is pushed (operator control panel), CONNECT switched on (SPIF connected), the power control switch set to REMOTE and processor operation mode switch set to OPERATE (maintenance control panel, normal operation), after connection of the processor, the peripherals and finally the CPU, the internal (PROM resident) processor tests begin running to check the individual microcomputers in the processor and BUS systems. Then the maintenance system with extended processor tests is loaded from the processor diskette.

These tests check the processor hardware and the connection path to the CPU (standard interface adapter, SIF; special interface adapter, SPIF). Only after successful completion of these tests does the loading of the processor operating programs from the processor diskette begin. After this, the current

processor configuration and processor adjustments are read from this diskette. The status frame (right lower half of screen) is displayed. Then reading in of the CPU microprogram diskette (IML) begins. The micro instructions are serially loaded through the SPIF into the CPU microprogram storage and at the end, the 80 bytes which contain the subchannel configuration. Then the power-on on the CPU is reset and the processor is placed on-line by pushing the OFFLINE/ONLINE button. At the same time, additional frames are displayed on the processor displays. With that, the processor and CPU are ready for operation. The CPU can be operated from the operator and service processor.

Operator Functions

Operator functions are implemented through 18 operator frames (plus 9 operator frames when the matrix module is connected). Compared to the previous type of processor, the YeS 7069 operator console, the range of functions has been considerably expanded. Help frame 04 (see section on help frames) displays a menu of all operator frames including program frames B1 and R1 (fig. 5).

Some features and special YeS 7069.M processor frames for controlling the YeS 2156 CPU are explained later. One feature allows calling logical addresses (call according to the translation lookaside buffer, TLB) when addresses are called (processor frame B3).

The address range is then up to 16M bytes.

Because CPU microprogram storage (MPS) has been expanded to 10K micro instructions, a special run of the MPS test is necessary (the ripple test). The test passes through the micro instruction addresses 0-FFE, then 2000-27FF, and then 1000-1FFF (hexadecimal) (processor frame B5). In processor frame B5, there is a new switch: S8 (serializer disabled). When this switch is activated, obtaining diagnostic data from the CPU on the signal select pyramid for the logic is switched off, which is also used for processing purposes; this logic can thereby be tested statically.

With configuration frame R0 (fig. 6), the configuration of the three processor devices (display 1, display 2, printer) can be adjusted. When identical device addresses are entered, a warning is displayed. The printer can be assigned as the log device for the typewriter mode only when the corresponding mode is adjusted for display 1 or 2. Changing the format for unbuffered printing is also allowed in the on-line state. Otherwise, a reconfiguration is possible only in the off-line state.

The function K allows the use of Latin lower case letters (on the Latin keyboard); the function S stores the adjusted configuration (also the other adjustment values, see frame R4, and the IPL address (initial program loading), frame B2 or R2) on a diskette.

Variable Display Frame R3

After pushing the variable function key VFK 3, any kind of text can be written on lines 2-11 (e.g. to leave a message for another operator). This text is

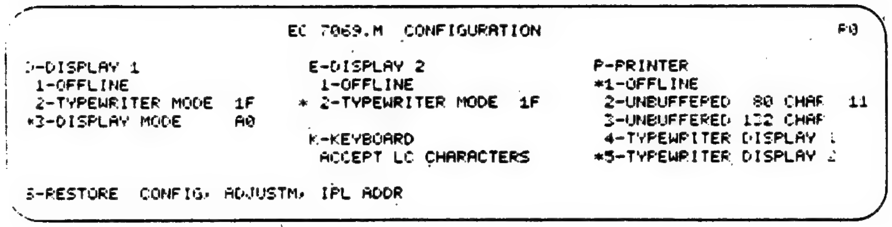


Fig. 6. Frame R0 (processor configuration)

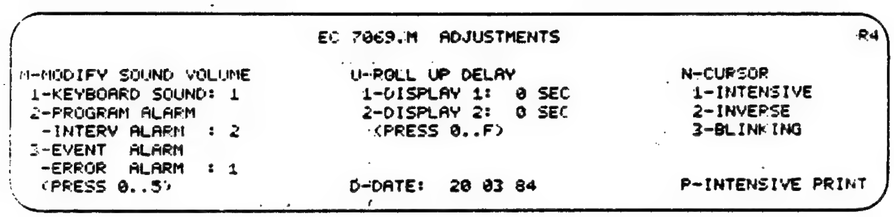


Fig. 7. Frame R4 (processor adjustment values)

stored to the diskette by using function S. When frame R3 is recalled, the text is again displayed. It can be cleared with the CLEAR key.

This function implements the principle of an electronic notebook on the processor (e.g. leave a message for another operator, for passing on shift notes...). When the CPU maintenance mode is enabled (MAINTENANCE ENABLE switch on the processor operator control panel), frame R3 has a different function. SAP addresses (SAP = signal select pyramid) can then be entered in the text area and certain registers and control flipflops in the CPU or matrix module can be displayed (LOGOUT). An entry (LOGIN) is also possible for the matrix module.

Processor Adjustment Frame R4 (fig. 7)

Frame 4 (adjustments) allows the adjustment of certain processor values. This is an operator aid that considerably facilitates operation; adjustments can be made to suit the individual or the computer center operation.

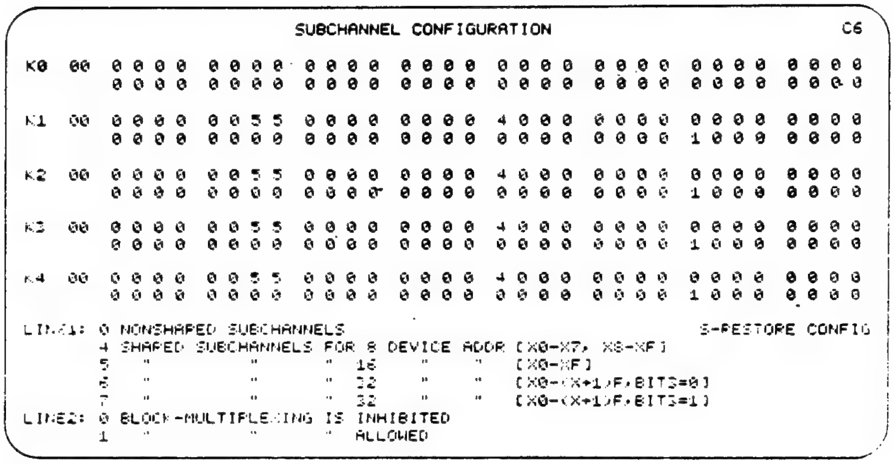
M - modify sound volume of audible processor alarms in steps from 1 to 5

U - delay roll up of screen contents in typewriter mode when a printer is not connected in range from 0 to 15 seconds (entry F)

N - adjust cursor brightness, inverse or blinking or a combination of the alternatives

D - enter date (day, month, year) with subsequent calculation of current day in year and display this on status frame (lower right half-frame).

P - intensive print (3-pass printing) for intensive characters on the screen. If this is not desired, an * is printed before the first character with intensive brightness.



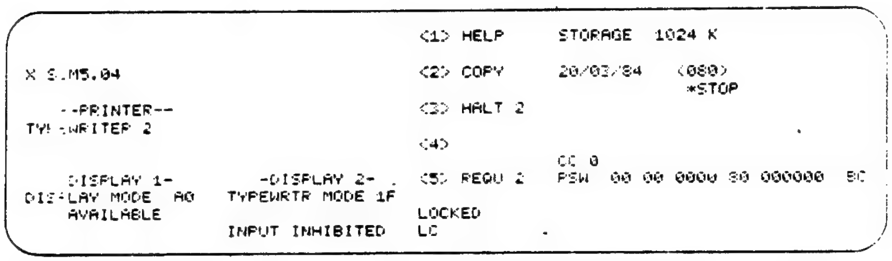


Fig. 8. [top] Subchannel configuration frame C6
Fig. 9. [bottom] Status display

Subchannel Configuration Frame C6 (fig. 8)

This frame is used to assign device addresses to a shared or nonshared subchannel. Also, devices which operate only in the selector mode can be made connectable to the block multiplexer channels [4]. Subchannel sharing for 8, 16 or 32 devices can be specified.

When a 4 is entered (shared subchannel for 8 devices), this is displayed on the first line. The cursor appears below on the second line. Whether or not block multiplexing should be allowed for the given subchannel can now be specified. When a 5 is entered (shared subchannel for 16 devices), the entry appears on both the first and second lines. When 6 and 7 are entered (shared subchannel for 32 devices), the entry appears on four lines from the even address (6) or odd address (7).

Function S is used to write the specified configuration to the diskette. During initial microprogram loading of the CPU, it is written to CPU microprogram storage and sent from there to the channels.

Status Display (Fig. 9)

The status display (processor right lower half-screen) contains the essential information on the CPU and processor status. The processor entries concern the diskette drives with indication of the drive number, READ or WRITE with indication of track number, the diskette type and name, check information on checkpoints taken, and processor capabilities (capability of 0 to 3).
0 : display inhibited
1 : disk read inhibited
2 : maintenance status
3 : operating status.

Processor information also includes the configuration of the processor devices display 1, display 2 and printer, what display the keyboard is assigned to (inverse display of DISPLAY 1 or DISPLAY 2), the SPIF busy indicator (BUSY), the assignment of the variable function keys VFK 1-5 and the keyboard case setting (UC = upper case; LC = lower case) and its status (LOCKED). The date input through frame R4 with the calculated current day of the year is shown too.

The CPU displays concern the program status word (PSW) and its mode (BC/EC) [basic or extended control] and the last condition code set when the CPU is in STOP status. Also shown are the usable maximal main storage capacity and the CPU status (STOP, WAIT, SYS, I/O, IPL).

The last two lines of the status frame are used for warning messages to the operator.

Program Frames

In program frame B1, 24 lines are available on display 1 for the display mode or typewriter mode; in program frame R1, 12 lines are available on display 2 for the typewriter mode.

The functions of these modes correspond to generally valid rules. A noteworthy feature in the display mode: When a cursor key and the right UC (upper case) key are held down at the same time, the cursor moves in the horizontal direction at four times the normal rate. In the typewriter mode, in addition to the roll up delay capability (adjustment on frame R4), the DELETE and INSERT MODE keys can be used.

Thus, faster and easier operation has been implemented in these operating modes too.

Hard Copy

The hard copy function has a number of capabilities to ease operator tasks. Thus, the printer can be made ready at any time by using the variable function key VFK2. This key is also used to start and stop the hard copy function and for abnormal ending of the printout. When printout of the whole frame is not required, the cursor is used to mark the beginning of the line to be printed. These operator capabilities ensure considerable savings in time and paper.

The hard copy function works in the typewriter or display mode as momentary input at the time the VFK2 key is pushed. Multiple depressions of the VFK2 key cause multiple execution of the hard copy function (key storage up to four times). An error message is displayed in the warning area of the status frame if a printer error occurs.

YeS 7069.M Processor Maintenance System

The maintenance system is loaded when the operation mode switch is set at MAINTENANCE SYSTEM (maintenance control panel) and the processor is turned on or the IMPL function is started.

In the maintenance system, 10 maintenance frames used for internal processor diagnostics can be called by the PF [program function] keys.

Maintenance frame PF 7 is of major importance since it allows a combined call of all internal processor tests (automatic and cyclic test run). These tests and the resulting ERROR MESSAGES, which incidentally are also displayed during normal processor operation (OPERATE) in event of an error, enable fault localization down to the PCB level.

Error Handling

Upon certain errors, the YeS 7069.M processor is automatically restarted (operating programs are reloaded). When an error is encountered, an ERROR MESSAGE is output to the display and printer (when assigned). If the operation mode switch is set to DEVSYS at the time of the error message output, a HALT occurs instead of an automatic restart.

Otherwise, after output of an error message, the maintenance system is loaded and a complete test is run. After the proper completion of the tests, the operating programs are reloaded; this enables further operation of the processor. This is another factor in raising processor reliability.

Help Frames

Help frames display text information for the operator and maintenance engineer. They help the operator and especially the maintenance engineer find information which is a permanent and immediately available brief form of the operator and maintenance documentation. They are called by using the variable function key VFK1 (help) and entering the appropriate help frame number from the menu on help frames 01, 02 and 03. See help frame 04 (fig. 6) for an example. Up to 960 characters (12 lines) of information can be displayed. There are 81 help frames that can be displayed.

In the maintenance system, 43 help frames can be called. They are displayed when the appropriate number in the basic maintenance system frame is entered or when the PF11 key is pushed after calling any individual maintenance frame. Maintenance system help frames can hold up to 1,920 characters. They are displayed on the left display.

BIBLIOGRAPHY

1. Voigtlaender, H., "YeS 7069.M Operator and Service Processor," RECHENTECHNIK/DATENVERARBEITUNG, Vol 18, No 2, 1981, p 7.

2. Anke, Dr. P., "YeS 7920.M Display System," RECHENTECHNIK/DATENVERARBEITUNG, Vol 18, No 2, 1981, p 11.

3. Lampenscherf, W., "YeS 2655 CPU," RECHENTECHNIK/DATENVERARBEITUNG, Vol 16, No 2, 1979, p 9.

4. Homilius, K.-H.; Lampenscherf, W.; and Weber, Ch., "YeS 2156 CPU," RECHENTECHNIK/DATENVERARBEITUNG, Vol 21, No 8, 1984, p 5.

8545
CSO: 2302/2

MEASURING TECHNOLOGY MODERNIZATION, VLSI INTEGRATION

East Berlin BERLINER ZEITUNG in German 19 Sep 84 p 3

[Interview with director Erhard Kuemmel and party secretary Wolfgang Krausch, Berlin VEB Measuring Electronics, by Dieter Resch: "New Technologies--New Products--Greater Efficiency; Breakthrough Achieved with Microelectronics"; date and place not specified]

[Text] To achieve a greater efficiency through new technologies and new products--that is an economic task of the first order. Where do we stand in this renovation process? What findings must be used in order to advance more rapidly? How do national leaders and party organizations encourage bold ideas and promising solutions? Is the unity of product development and technology guaranteed in advance? BERLINER ZEITUNG is providing information about these questions from enterprises in the capital area. Today our interviewees are Erhard Kuemmel, works director at the Berlin VEB Measuring Electronics, and party secretary Wolfgang Krausch.

BERLINER ZEITUNG: Last year, Measuring Electronics revamped 40 percent of its line of products, and this year it is to be 40 percent again. After years of stagnation, what has led to this about-face?

E. Kuemmel: There was really only one effective course, and that was the comprehensive application of microelectronics. For us, that meant on the one hand to provide every product with microelectronics, and on the other hand also to break technological new ground in the manufacturing process with the broadest possible use of microelectronics there. A course which our party had pointed to a number of years ago now and had called for again at the 7th conference...

W. Krausch: ...a course which, however, was avoided by us for a long time, because after all our equipment could still be sold. Therefore at the right time this question was placed on the agenda in no uncertain terms by the party leadership. In a resolution the enterprise leadership stipulated that a scientific-technical plan should be worked out. Over the long term, this plan was supposed to involve the systematic revamping of all products and corresponding technologies on the basis of the microelectronics available in the GDR or the CEMA.

Cause and Effect Analyzed in Depth

BERLINER ZEITUNG: Resolutions are one thing, to realize them is another. How did you manage to finally get almost the entire enterprise to respond to this policy?

E. Kuemmel: The morale in the enterprise was not good. This was the result of a working atmosphere marked by turmoil. There were maladjustments between prefabrication and assembly, and delay times alternated with overtime periods. By means of a thoroughgoing analysis we worked out cause and effect. These included also the facts that for years on end systematic research and development work had been neglected and that employees in these sectors were used to fulfill the quotas at the production end. Who likes this sort of situation, anyway? And thus our resolve to break through this vicious circle with the aid of microelectronics fell on sympathetic ears in all sectors.

W. Krausch: Nevertheless all of this took much effort, with a comprehensive political mass work being necessary. Jointly with our colleagues in research and development, we led the discussion on changing previous standards. It was important to convey the assurance that within the terms of this intensification, above all the higher economic result and not necessarily the most sophisticated engineering details must be placed at the beginning of all considerations. In this area as well the communists took the lead, armed with party instructions. Today I am pleased that at that time there were discussions with everybody. This situation has brought socialist teamwork to the fore, and it has been a great help to us in winning the participation of 500 workers in a training program which we organized on the basis of the new scientific-technical plan of the enterprise.

BERLINER ZEITUNG: Economically speaking, what now emerges as the bottom line?

E. Kuemmel: The objectives in the tasking workbooks were exceeded by 20 percent on the basis of a clear development program--that has never happened before with us. Specifically, the situation appears as follows: In our new generation of selective measuring technology equipment--which is used for field-strength and radio-interference measurement, and thus is needed in many industrial branches--the productivity of labor is increased by 230 percent compared to the predecessor products. Nowadays we only need 500 parts per device, whereas previously the number was over 1,000. Incidentally this has led also to a reduction of our capacity maladjustments which existed for many years. Moreover we have been able to decrease the weight of the new products by a third. With that, a total of 23 tons less of steel, 40 kilograms less of silver, and more than 10 tons less of aluminum are being consumed. It becomes especially manifest in such results how much it pays to do what Guenter Mittag called for at the 9th Berlin Conference of Highest-output Workers: The close connection between high replacement rates and greater economy must always be observed.

Through Robots the Required Testing Time Drops Considerably

BERLINER ZEITUNG: A high efficiency can be achieved only if a top-of-the-line product is manufactured also by means of a leading technology. What route have you followed in this connection?

E. Kuemmel: In the system tasking workbooks introduced by us, both product development and operational steps for an efficient manufacturing have equally great importance in achieving our goal of maximum economy. Thus already at a very early stage, for our new products we developed tools and testing robots which could be used at the beginning of pilot production. By using such robots, the required testing time is decreased from an earlier 4 hours to 40 whole minutes. Also an automated cassette jointing technology as well as a likewise non-manual microflame soldering technology have been developed in connection with our own construction of means of rationalization.

Whoever takes this approach must provide for a new type of socialist teamwork, from product development up to the production. This functions all the better the more clearly everyone feels that the results pay off for him as well. In our case, in the wake of all these changes working conditions have considerably improved for a third of the workers.

W. Krausch: When the long-range scientific-technical plan was worked out, we also organized a completely different series of intensification conferences. Subsequent to the works director having explained the new tasks to all his colleagues, we are meeting further in three working groups. Although in these we are separating product development and process development as well as material-technical questions, nevertheless in each group representatives are sitting from all the other sectors. Even the sort of questions which are only organizational in appearance have helped bring it about that under the leadership of the party organization and jointly with the trade union, the FDJ [Free German Youth], and the Chamber of Technology, an initiative movement has arisen which today has turned into a genuine comprehensive competition for the most modern microelectronic solutions.

BERLINER ZEITUNG: Parallel work such as you are practicing includes a substantial measure of readiness to take risks. How far can such a risk go?

W. Krausch: Gadgets are out of the question, of course. But shorter conversion times in connection with new products are possible only if one takes the risk that matters will go awry sometimes. In such a case it is not so essential to find out who has failed here. It is much more important to learn from this and to make good use of the experience gained. Mistakes have also happened to us. But it has been appreciated that we as leaders have shared the responsibility.

E. Kuemmel: In research and development the process of understanding is assimilated in stages, and sometimes even a course assumed previously to be

right must be abandoned. In this connection, it is bad if there is only a reconstructing of what others have discovered long before us.

Clear Orientation to Inventive Solutions

BERLINER ZEITUNG: Is there self-criticism in this remark also? After all, in terms of patent productivity your enterprise certainly is not yet in the lead.

W. Krausch: Of course we must view this self-critically as well. It is true that we are coming up with too few inventions. From that we as the party leadership have derived the orientation of setting new tasks in advance for inventive solutions in connection with the elaboration of themes for new products and procedures and of also organizing in a more goal-oriented way the patenting work and patent-protection work by the leadership. But it is also important to encourage the researchers to have pride in their work.

BERLINER ZEITUNG: What is now pressing above all for you?

E. Kuemmel: We are talking first about a beginning with microelectronics. Now what is important is to ourselves do more to have specific circuits for our technology. We cannot leave this up to others. Therefore at present we are developing on our own a design center for such circuits. At the same time we must begin to produce types of modern measuring and test equipment not yet built in the GDR, in order to help foster the development and production of microelectronic consumer goods.

BERLINER ZEITUNG: At the Berlin Conference of Highest-output Workers, Measuring Electronics was criticized because of an inadequate consumer-goods development and production. How do you react to that?

E. Kuemmel: This year, for the time being we have incorporated in our production end certain devices for TT [expansion unknown] railroads. With that we want to exceed our 1984 plan by a half a million marks. Of course, by and large this is not yet enough. Therefore a youth-researcher collective has taken over the development of new products for the household and for do-it-yourselfers. In 1985, we want our consumer goods to reach for the first time a fraction of 5 percent of the total production. Our plan provides for an expansion from year to year of the share held by consumer goods production. Here also the degree of renovation must be greater than 30 percent.

12114
CSO: 2302/4

USE OF ROBOTICS IN HEAVY MACHINERY, EQUIPMENT CONSTRUCTION INDUSTRY

East Berlin PRESSE-INFORMATIONEN in German No 83, 19 Jul 84 p 2

[Article by Rolf Kersten, minister for Construction of Heavy Machinery and Equipment: "Greater Effectiveness Through Comprehensive Streamlining and Application of Robots"]

[Text] In the heavy machinery and equipment sector of the economy, 85 percent of all investments are used to further mechanize and automate production processes with the objective of bringing the rationalization process up to a level which, as emphasized at the seventh and eighth SED Central Committee Congresses, is necessary in order to implement our economic strategy and to make the tasks of the workers more effective, less menial and physically easier. In this regard, for example, final assembly of refrigerator cars at the VEB Railroad Car Construction, Dessau was completely reorganized. Based on the combine's own rationalization equipment construction and in close cooperation with its partner construction and equipment factories, workplaces in the combine were redesigned and restructured in accordance with scientific findings in the field of organization of labor. In this way it was possible to reduce the number of workplaces, and 84 of the combine's own workers could be put on shift work.

Intensification of Combine's Own Rationalization Equipment Construction Effort

High economic gains are above all made where the restructuring of entire manufacturing processes is combined with the implementation of industrial robots. In the S. M. Kirow VEB Heavy Machinery Construction, Leipzig, it was possible to assign 8 workers to other tasks through the establishment of a manufacturing process for which fewer personnel are needed, and which incorporates a non-dedicated industrial robot. On the other hand, at the VEB Transmission Factory, Gotha, the step-by-step comprehensive restructuring of the manufacturing process together with the use of 4 industrial robots made possible the elimination of 6 workplaces and the reassignment of 15 workers to other areas within the VEB. These changes were preceded by comprehensive process analyses. Preparation and transition collectives within the factory had helped to work out the most effective solutions, and put them into practice. In these factories, too, the collectives utilize above all the potential of their own rationalization equipment construction. Our goal must be to further expand this procedure. Whereas this year our industrial combines and factories will

increase their production of rationalization equipment by 6 percent as compared to 1983, an increase of at least 18 percent above the 1984 level is planned for 1985.

In order to make initiatives and experiences of the combines more quickly available to all in the intensification of production and to put the most recent scientific and technical developments into practice more quickly, the ministry is making particular use of the existing management and coordination centers in industry. These centers have at their disposal technical and technological documents concerning selected rationalization projects within the GDR and also projects which are the result of cooperation with the Soviet Union and other socialist countries, and also make information available in conjunction with these projects concerning exact information with regard to the international level of development. The Management and Coordination Center at the Central Institute for Welding Technology (ZIS) of the GDR in Halle, for example, informs the combines about the most recent developments in the manufacture and implementation of welding robots via its regularly published report as well as through seminars scheduled by the center. The results of technological studies and tests will be made available to the factories shortly.

The VEB Construction Machines, Halle, as the central producer of ZIS welding robots, provides a broad base for the application of economically favorable alternative industrial robot designs. The results obtained by this VEB during research into non-dedicated industrial robots are offered in user-oriented fashion.

Many Partners Working Together

The scientific and technical Management and Coordination Center for Forging Robots in the "Heinrich Rau" VEB Heavy Machinery Construction, Wildau, and the "Microelectronics/Industrial Robots" Consultation Center in the VEB Research, Development and Rationalization, Magdeburg, have also proven valuable. The latter center holds specialist conferences, courses and consulting sessions on the most recent results of research in close cooperation with the Chamber for Technology, the "Otto von Guericke" Technical College, the "Industrial Robots" Science and Production Cooperative in Magdeburg Bezirk and the combines. In the past year, 300 specialists from over 200 factories received consultation at this center. The center is currently involved in determining the best ways in which industrial robots can be used in assembly work.

Industrial robots are being used more and more frequently in the GDR in the manufacture of consumer goods to bring about increased production. The results which can be achieved if robots are used at the right points in production is illustrated by an example from the Georgi Dimitroff VEB Heavy Machine Construction, Magdeburg. Within the scope of consumer goods production, this factory makes trailers for passenger cars. A robot installed to weld the various components together tripled production of a specific trailer subassembly.

An additional 800 industrial robots are scheduled to be in place next year in our industrial combines and factories, bringing with them the comprehensive rationalization of many production processes. Preparation for this project has already begun with discussion of our national goals for 1985.

12644
CSO: 2302/13

ROBOTICS TECHNOLOGY APPLICATION ASSESSED, STATISTICS

East Berlin PRESSE-INFORMATIONEN in German No 88, 31 Jul 84 pp 5-6

[Unattributed article: "Application of Industrial Robotics Technology for High Production Capacity and Continued Improvement of Working Conditions"]

[Text] More than 35,000 industrial robots are currently contributing effectively to improved performance within the economy. Their number has grown rapidly in the past several years. In 1981, more than 13,700 robots were at work in the national economy of the GDR. By 1982, there were roughly 22,400, and in 1983 more than 32,100. This trend is in keeping with the directive of the 10th SED Congress with regard to the five year plan which stipulates that a total of 40,000 to 45,000 industrial robots are to be manufactured and put into operation in the period from 1981 to 1985. Robotics is used under socialist conditions for rapidly increasing labor productivity as well as for significantly reducing the number of hazardous, monotonous and physically demanding tasks. High economic output is achieved and working conditions are decisively improved through modernization and step-by-step automation of entire production processes by using industrial robots.

Of the roughly 32,100 industrial robots in use in the national economy at the end of 1983, nearly 27,300 were in use in industrial applications. They are used primarily to automatically manipulate workpieces, tools and materials, and have performed excellently in the areas of welding and painting, and in loading machines and industrial furnaces. In the main factory of the "Herbert Warnke" VEB Metal Forming Combine, Erfurt, for example, a production unit comprising an industrial robot and two lathes was constructed, which brought about a 180 percent increase in labor productivity. This is an example of the objective of robotics in the field of machine tool and processing machine construction--to use robotics to modernize production equipment to such a degree that the output of the individual machine is increased by at least 30 percent and automation is greatly enhanced.

A powerful testing robot in use at the "Otto Schoen" VEB Robotron Test Electronics, Dresden can find production defects on medium-sized printed circuit boards with roughly 300 components in just a few seconds. Each robot relieves up to 12 workers of stressful, monotonous work so that they can perform more fulfilling tasks.

The manufacture of gears for gear motors and clutches at the VEB Gear Factory, Pritzwalk was largely automated through the use of six non-dedicated robots. In addition to a significant increase in output, it was possible to reassign 17 workers to better utilize other important equipment in the factory.

Industrial robots are systematically assuming more and more tasks, not only in the metalworking industry but also in other branches of industry and the national economy. In the coal and energy sectors, for example, robots are used for rationalizing the loading of large-scale strip-mining equipment. They unload and clean coal cars, actuate electric switching systems, start up boiler installations and monitor worker safety and production reliability.

In the traffic sector, around 1000 robots are currently being used for transport, transhipment and repair processes. A microelectronically controlled industrial robot in the Reichsbahn railroad repair facility in Cottbus, for example, cleans small parts in the repair of diesel locomotives, thus replacing the manual labor of four workers. The robot is equipped with a magazine which can hold the workpieces for an entire shift.

Picking up, transporting and stacking heavy pipes, stones, slabs, rolls and railroad ties as well as other prefabricated units is an important application for robotics in the construction industry. However industrial robotics has also proven to be excellent in technological areas as well, such as in cutting floor coverings to size and in taking over the physically demanding transport of construction materials.

Socialist rationalization and automation have always had as their goal the improvement of working conditions according to plan along with a simultaneous increase in productivity. This also applies without exception to industrial robotics. For this reason, the work performed by each robot must also meet certain social requirements--at least 2.5 workers must thereby be freed to assume new, demanding and interesting activities. For in our society technology serves man, robots do not compete for jobs and there is no unemployment. This combination of social and economic policy is expressed in the combines and factories by the fact that the workers have an important say even in the preparatory phase and in determining how robotics can be most effectively implemented. They contribute their know-how and experience in determining the way in which high economic achievements and significant improvement of working conditions can be comprehensively realized. Here, practical experience has shown again and again that the best results are obtained when entire manufacturing processes have been redesigned based on modern technologies to take advantage of industrial robotics.

The fast pace of industrial robotics development and application in the GDR is due in large part to the fact that the factories and combines are making increasing use of their own resources. They have manufactured robots which have raised the level of production technology and have improved working conditions in varied applications, and they have done this above all through rationalization equipment construction, as illustrated by the main factory of the "KARL MARX" VEB Magdeburg Fittings Works--fittings combine, where machine tools have been modernized with the aid of the combine's own rationalization equipment,

and have been combined in conjunction with robots to form largely automated production lines. Productivity was increased by 35 percent.

Young workers from the VEB Tractor Construction, Schoenebeck received a gold medal at the "Central Fair of Tomorrow's Industrial Leaders" (Zentrale Messe der Meister von morgen) last year for the welding robot which they built themselves. Of the more than 90 robots put into operation to date in this factory, one out of every two was the product of the factory's own rationalization equipment construction. In the "Hermann Matern" VEB Strip Steel Combine, Eisenhuettenstadt, a robot developed for attaching steel straps can be used for many different labor-intensive and physically difficult packaging processes in the metallurgical combines.

Intensive seminars involving the combines and factories, as well as the systematic use of the centralized industrial robotics database in the research center of the Karl-Marx-Stadt machine tool construction complex, have contributed in no small way to the fact that factory robotics applications which have already been proven effective have been implemented in other factories, thus avoiding parallel and redundant development.

Universities and technical colleges in our country are making an important contribution to the development and implementation of industrial robotics. For many years, for example, there has been close and beneficial cooperation between the Karl-Marx-Stadt Technical College and the "Fritz Heckert" VEB Machine Tool Combine, the VEB Electrical Machine Construction Combine and the VEB Textima Combine. The most recent example of this cooperation are sewing robots developed jointly with the VEB Garment Factory in Loessnitz. These robots have already performed excellently in production. The "Otto von Guericke" Technical College in Magdeburg is working together primarily with the heavy machine construction and plant engineering combines in this city on the Elbe River on a joint program dealing with such complex tasks as the use of robots in automated factories. New developments made at the Technical College in Ilmenau, such as the use of robotics in assembly and jointing processes, have already been implemented to advantage in numerous combines in the GDR.

In many Bezirks and Kreises in our republic, beneficial and broad implementation of industrial robotics is being effectively promoted within the scope of regional rationalization. In Karl-Marx-Stadt Bezirk, for example, a joint industrial robotics scientific and production group is active, and there are 27 robotics interest groups in the Kreises. Currently 250 factories involved in these groups offer one another support in production and preparation for the use of robotics. Maintenance work to be performed on the more than 6300 installed industrial robots is also coordinated by the factories.

In 1980, a cooperative was formed in the city of Leipzig to accelerate the implementation of robotics. The cooperative is made up of 33 partners from industry and science. With the more than 260 new industrial robots which will begin operation this year in Leipzig, the total number of robots in use in the city's combines and factories has increased to over 1300.

It was decided at the Congress of Working Youth of the GDR (Kongress der Arbeiterjugend der DDR) that youth brigades and youth work projects will be used to put 10,000 industrial robots into operation during the second half of the current five-year plan, thus making it possible for at least 25,000 workers to assume new and interesting tasks, for example in rationalization equipment construction or in the production of consumer goods. Bezirk "industrial robots" youth projects will help to realize this obligation of the FDJ "industrial robots" initiative. This creative contribution of our youth toward achieving demanding scientific and technical goals has resulted in the manufacture and implementation of more than 2700 robots last year and more than 1800 in the first half of 1984 in the "industrial robots" initiative of the FDJ alone. The experiences in Karl-Marx-Stadt Bezirk provide a good example of such activity. They illustrate the great tutorial effect activities involving modern technology have on young workers, as well as their desire to make an effective contribution within the national economy toward strengthening our republic. Seventy percent of the applications for robots in the Bezirk come within the purview of youth projects--7000 robots are to be manufactured and 5000 are to be used effectively in regional areas.

Every fourth worker in the GDR is receiving initial training and continuing training in which microelectronics and robotics are two of the most important elements. The accelerated development, production and use of industrial robots in our republic therefore enhances worker qualification in a number of ways and allows us to assign interesting new tasks to an increasing number of our workers.

As early as in vocational training--2.7 million young men and women were trained as specialists from 1971 to 1983--basic knowledge and skills are learned in the areas of electronics, industrial measuring, control and regulating technology and electronic data processing.

Workers involved in the preparation and implementation of robotics or maintenance of industrial robots must acquire additional specialized skills, such as those involved in programming and the technology of robotics. In the VEB Steel and Rolling Mill Tube and Pipe Combine, Riesa, the necessary training and qualification were accomplished with assistance from the enterprise academy and the Chamber for Technology.

In Halle, the VEB Light Alloy Construction Combine organized 17 continuing training sessions in the field of robotics involving around 500 workers from various factories in the city. Qualification in Karl-Marx-Stadt Bezirk is also being coordinated on a regional basis. The factories decide on projects among themselves at the Kreis level and make joint use of the available materials and technology. Timely cadre selection and recruitment as well as thorough training which draws heavily upon factory experiences are major factors in determining the level and speed at which industrial robotics is developed.

12644
CSO: 2302/13

NEW INDUSTRIAL FACILITY PRODUCTION CENTER TO ENHANCE EXPORTS

Bonn DIE WELT in German 25 Aug 84 p 10

[Article by Claus Hoecker, Berlin: "Eastern Exports to be Stepped Up"]

[Text] With the concentration of robotics research in one of its own combines, the GDR is streamlining its export efforts directed at eastern technology markets. In addition to the computer-oriented Robotron Combine in Dresden, the "Central Metallurgical Industrial Equipment Construction" Combine, founded in July in East Berlin, will play a key role in new developments in the future. It will concentrate on supplying complete industrial plants.

While in western industrialized nations the new industrial revolution born of the recession which followed the oil crisis has long been in high gear, The CEMA economic conference held in June represents both a challenge and a temptation to the GDR, where advanced technologies have only slowly begun to develop. In Moscow the heads of state and party leaders ascribed special significance to electronics and robotics, most likely in view of western export controls.

The supply of entire product lines geared to the use of robots could be a mainstay of GDR exports over the long term, as Czechoslovakia is probably the GDR's only competitor. After having gained some stability in trade with the West, East Berlin's objective is now above all to reach a balance of trade with the Soviet Union, or perhaps even an export surplus. The German Institute for Economic Research (DIW) estimates that the GDR has run up debts in Moscow of the equivalent of five billion dollars.

The term "robot" in GDR parlance has a broader meaning than it does in western usage, and includes fully- and semi-automatic equipment.

The "Automation Enterprise, Berlin", formerly known as the "Central Engineering Enterprise for Metallurgy" (ZIM), forms the hub of the new combine. Grouped around it are the "Metallurgical Plant Construction Enterprise, Wittstock", which has introduced a welding robot which has just gone into series production, "Metallurgical Electronics, Leipzig" and "Metallurgical Furnace Construction, Meissen".

In spite of this joint effort, the domestic economy of the GDR will continue to depend on decentralized initiatives on the part of each production unit. In electrical engineering and electronics, for example, 90 percent of the required number of robots must be made by each production unit in the course of so-called rationalization equipment construction.

Not the least of reasons why the ministry in charge is pushing for effective decentralized construction of robots are unpopular night shifts which it would be better to run with as few personnel as possible, as well as the transition to "rolling shifts" on weekends.

12644
CSO: 2302/13

PLANS FOR MACHINE TOOL MODERNIZATION OUTLINED

East Berlin PRESSE-INFORMATIONEN in German No 102, 31 Aug 84 p 3

[Article by Deputy Minister Egon Hempel, Ministry for Construction of Heavy Machinery and Equipment: "Modernized Capital To Be Used Multilaterally"]

[Excerpts] Almost 92,000 machine tools are being used in heavy machine construction and installation construction. It is clear that we use this considerable investment as efficiently as possible. We place special emphasis on utilization of these high productivity machines in several shifts since this increases productivity of enterprises and combines quite rapidly.

In modernizing and utilizing our basic capital we concentrate primarily on capacity-determining machine tools in the major production processes and on the optimum design of whole production sectors. Until the end of next year about 8,000 machine tools are to be mechanized so that they can satisfy the increased technical and economic requirements.

During the first half of this year we were able to increase time utilization of these high productivity machines by half an hour to 15.9 hours, compared to the same period of last year. This clearly shows the efforts of the collective of Heavy Machinery and Installations Construction to master the required increase in efficiency achieved through equipment modernization and increased day-by-day utilization.

Experiences show that good results can be obtained especially when goal oriented management and thorough preparation of modernization, as well as better utilization of machines create the needed prerequisites on a timely basis. For example, a capacity determining gear shaving machine was augmented with operating equipment. This permitted automatic loading of the machine, which in turn facilitated multi-shift operation.

Goal Oriented Utilization of Capacity

Based on our experience it is advantageous if, where space considerations permit, capacity for general repairs, of construction of rationalizing tools, and of maintenance can be combined to serve several enterprises, for modernization and for better utilization of basic capital. This practice has been established, for instance, in the Magdeburg combines VEB Magdeburger Armature

Works Karl Marx, VEB Heavy Machinery combine Ernst Thaelmann, VEB Heavy Machinery Construction Karl Liebknecht and VEB Combine Transmission and Couplings. In order to set up a central facility for the manufacture of rotational symmetric parts, among others, a key seating machine was needed. Collectives from the VEB Heavy Machinery Construction combine "Ernst Thaelmann" built this machine themselves and equipped it with modern electronic controls which saved not only money but also working time. This year alone this will amount to 2,300 hours. The completely hydraulic operation of all functional motions and the great reliability of electronic machine control permit utilization of the machine in three shifts.

7994
CSO: 2302/15

MICROELECTRONICS COMBINE PRODUCTION STATISTICS CITED

East Berlin PRESSE-INFORMATIONEN in German No 94, 14 Aug 84 p 2

[Article by Dr Heinz Wedler, general director, Erfurt VEB Microelectronics Combine]

[Text] Annual increases of 20 percent and more in the production of microelectronic circuits as well as the development of new equipment generations ever 2 to 3 years are an essential basis for the broad application of microelectronics in the national economy. This also sets the standards for the performance development of our combine. All initiatives and activities of the workers in the socialist competition in honor of the 35th anniversary of the GDR are directed toward meeting these national economic demands. Successfully, as is indicated by the balance for the first half of 1984: all of the main indicators for evaluating performance were met or exceeded.

In their obligations, the collectives have set for themselves the goal of even accelerating the pace in the second half of the year. Thus they want to increase net production--the plan already foresees an increase to 122.8 percent--by 1.4 percent, labor productivity by 1.3 percent, and net profits by 1.5 percent, and they want to produce 3.3 percent more finished products for the population. Behind these figures, there are, for example, 60,000 unipolar components, 25,000 men's quartz wrist watches and 4,000 living room clocks over and above the plan.

How could these good results be achieved and what is the way to realize further progress? It has been our belief that the new stage in the realization of the economic strategy of the 10th SED Congress essentially requires the consistent putting into effect of comprehensive intensification in all phases and sectors of production. A decisive criterion for this is the relationship between expenditures and results. It is for this reason that performance comparison within the combine as a fundamental method of the political control of economic processes is primarily directed toward the analysis and overcoming of unjustified differences between the combine's enterprises in level and growth. Proceeding from the reasons for the differences, information is exchanged with the goal of ensuring rapid improvement in performance through plan-effective conclusions.

Gain in Time Through the Early Startup of New Capacities

A second important way to gain time is the early startup of new production capacities. For this as well, we use the performance comparison and organize a specific exchange of information. On this basis, for example, it was possible through the high output of the involved work collective to turn over a production sector in the VEB Semiconductor Works in Frankfurt/Oder 5 months ahead of time. In this way, an additional 4 million solid-state circuits can be made available to the national economy this year. In the VEB Microelectronics "Karl Liebknecht" in Stahnsdorf, a production line for power electronics began production 3 months ahead of the plan, and an investment project for important electronic components was finished 6 months ahead of schedule in the VEB Microelectronics "Friedrich Engels" in Ilmenau.

Robotics is being used systematically both in the newly created operational sections and in those to be modernized. About 420 industrial robots utilized in three shifts will make it possible this year for over 1,100 workers in the combine to undertake new activities that are more diversified and interesting.

It has been confirmed in our combine as well that the presentation of demanding performance goals must include incentives for meeting them. Both are the basis for competition and for the moral and economic interest of the workers in high results. We thereby focus on the main indicators of performance evaluation, but we also stimulate such important factors as the sale of commodity production according to contract or the maintenance of inventories. Collective and individual performance indicators are combined in such a way that all workers in the enterprises are oriented toward good personal work results and, at the same time, toward the fulfillment of the collective goals.

The Goal Is a Renewal Rate of 32 Percent

The collectives are consulting on the 1985 tasks in close connection with the continuation of the competition. In the coming year as well, we want to continue the successful course of a rapid development of output. Proceeding from the needs of the national economy, findings from science and technology must be made effective in production more rapidly. A renewal rate of about 32 percent, increased production with a declining outlay for material, raw materials and energy along with a rapid increase in the production of consumer goods are goals for the realization of which the collectives are creating the best preconditions with high competitive performance during these weeks and months.

9746
CSO: 2302/10

COMPUTER CENTER COORDINATES RESEARCH, CUTS COSTS

East Berlin NEUES DEUTSCHLAND in German 19 Jun 84 p 2

[Article by Ulla Massow: "Research Facilities Used Jointly"]

[Text] The bottom line is a sum of M11.5 million when one adds up what 16 installations of Rostock District have saved in the last 5 years by providing for a better utilization of the basic means for research and development. The partners are the University of Rostock, advanced schools, institutes of the academies of the sciences and the agricultural sciences, and seven combines and enterprises of the coastal district, which joined forces in 1979 to form a user association of scientific equipment. They now use equipment, power units and facilities valued at more than M200 million on a cooperative basis.

A catalog that provides information on major scientific equipment available in the territory and that offers 32 services and special applications of the respective partners has turned out to be an important working tool. Beyond that, 200 laboratories with their performance characteristics are included in a laboratory document, making possible rapid information on their technical equipping, their specialists and the degree of shared use. In addition, the partners set up a chemical exchange so that they can quickly exchange substances that are in part needed in only small quantities for scientific analyses and tests.

The user association is managed by the Wilhelm Pieck University of Rostock, which also takes in the consultation office for the cooperative work. With the aid of this consultation office, it was possible to send tools and equipment that are not sufficiently used in individual installations to places where they were urgently needed. Thus important research work was secured with no less of time or additional costs. The transferred quipment alone amounts to M1.7 million, money that did not have to be paid out for new acquisitions.

In this way, the partners in the user association have made another step forward in recent months. They are already coordinating the procurement of scientific equipment. The idea is thus to achieve from the beginning an optimum utilization and a deliberate improvement of the technical equipment basis for research. Thus, for example, it was made possible to have various

advanced schools and institutes share in using a newly acquired scanning electron microscope. "The trust of the partners in each other has grown through the force of these examples," assesses association secretary Siegfried Hellwig from Wilhelm Pieck University.

The Rostock partners are also using the advantages of cooperation for the construction of their own scientific equipment and rationalization means so that they can continue to raise the level of the material-technical base for their research projects. Six jointly used digital workplaces were created for the manufacture of electronic printed-circuit boards. In addition, specialists from the advanced engineering school for sea navigation in Warnemuende/Wustrow developed a now-patented marking machine for designing printed-circuit boards. It reduces significantly the time spent for such work. The Combine Maritime Traffic and Port Economy provided the user association and other enterprises of the city with about M400,000 in funds for rationalization.

A "New Technology" working group was formed within the cooperation just a few weeks ago. It is to make sure that in the future certain microelectronic modules can be used for the construction of various items of research equipment and rationalization means so that in this way the available intellectual and material potential can be used to a maximum.

9746
CSO: 2302/10

BIOTECHNOLOGICAL RESEARCH OBJECTIVES DESCRIBED

East Berlin BERLINER ZEITUNG in German 15-16 Sep 84 p 13

/Interview with Prof Dr Friedrich Jung, director, GDR Academy of Sciences Central Institute of Molecular Biology, by Dr Rolf Kraushaar: "Biotechnology on the Threshold of a New Nature," 27 Sep 84, URANIA Lecture Center, Berlin Municipal Library/

/Excerpts/ The large successes of the biological sciences, especially in molecular biology, have become the basis for new biotechnical procedures that promise revolutionary prospects for production and that have already become effective for the extraction of medicines. "A new technical revolution through biology?" is also the subject of Prof Dr Friedrich Jung in the framework of the lecture series "Research and Progress" of the Academy and URANIA (5 pm, 27 September 1984, URANIA Lecture Center in the Berlin Municipal Library). We spoke beforehand with the well-known pharmacologist.

/Question/ Thus man will be put in the position of quite purposefully creating organisms with qualities that they would never develop naturally.

/Answer/ Yes. Gene technology opens up such revolutionary prospects. Social areas under the influence of the biological sciences thus face a change similar to that brought to many branches of industry by microelectronics.

Since genes are production specifications for distinct proteins, including enzymes and hormones, we can now get cells and organisms to do work that is quite specific and important for us. An example is the intestinal bacteria that produce in this way the hormone insulin that is so important for the diabetic. It is already being used clinically. In this way, it will be possible to obtain such hormone-like factors as the human growth hormone or interferon that are not directly available to us or are difficult to obtain. An additional goal is the effective large-scale production of technically necessary enzymes with the help of manipulated micro-organisms.

/Question/ Is the cereal plant that binds nitrogen a real dream for the future?

/Answer/ That is an interesting goal but one that is also very difficult to reach a goal that is the subject of intensive international efforts. Instead of Leuna, one imagines a wheat field that provides its own nitrogen fertilizer, just as the lupines can. I will venture no forecast here. Meanwhile, there are other tasks that are closer and more realistic. Most vegetable proteins, from the papilionaceous plants (peas and beans), for example, are not quite as ideal for our diet as milk or meat protein because of their amino-acid composition. One could change the genes for these vegetable proteins in such a way that the food value of pea porridge would be closer to that of cheese or cutlets.

/Question/ What benefit does the use of methods in gene technology promise, especially in the area of medicine and in your specialty, pharmacology?

/Answer/ Medicine in our time is simply unthinkable without recourse to the findings and practical results of biotechnology. As everyone knows, not only the life-saving antibiotics (penicillin, for example) but also several other drugs are obtained through fermentation. Through the use of production stocks that have been altered by using gene technology, it is possible to achieve increased yields and improved variants of the mentioned drugs. We use enzymes on a large scale in diagnostics and therapy. production of such enzymes as well as other active substances will be decisively facilitated through micro-organisms that have been manipulated by gene technology.

/Question/ In concluding, can you give another example of fruitful teamwork between science and practice?

/Answer/ In this regard, I think above all of the large-scale production of high-quality protein feed for swine by our petrochemical industry, which came to fruition in the 35th year of our republic and is saving us expensive imports. Decisive in the success of this project was, in the first place, good socialist teamwork with specialists from the USSR, where there was extensive experience, and, in the second place, the close cooperation of all of the partners from basic research to the construction of facilities, naturally including the specialists for animal nourishment and the physicians who bear responsibility for the high quality of the product and its harmlessness. The experience gained here will help us to be successful in carrying out other important projects as well, and especially projects in the area of the production of drugs.

9746
CSO: 2302/5

BRIEFS

MACHINE TOOL COMBINE LAUDED--The title "Enterprise with Excellent Work Quality" was awarded to the combine "Fritz Heckert", the largest enterprise in Karl Marx Stadt. During the first six months of this year 26 new and improved machine tool models, which are produced in this giant industrial enterprise, were awarded the honorable quality mark. All of these are modern metal working systems and electronically controlled production lines. Equipments built by the enterprises of the combine enjoy a good reputation in many countries. They are also well knwon in the Soviet Union: The machine tools from Karl Marx Stadt have proven themselves in the machine tool plants of Chevoksaryi and Ivanovo, Togliatti and Minsk, in the Leningrad "Elektrosila" plant and in the "KamAS". Continuous improvement of product quality is one of the most important points of the socialist obligations of the collective of several thousand workers. On the eve of the 35th foundation of the GDR the machine builders announced their intention to exceed plans for this year and to make the jubilee year the most successful in the history of the plant. Close cooperation with 20 plants and research institutes in fraternal nations promotes renewal of the production program and helps to reach the planned goals. [Text] [Tselinograd FREUNDSCHAFT in German 21 Aug 84] 7994

LEIPZIG ROBOTICS APPLICATION INCREASING--At least 260 industrial robots are to be installed in combines and plants of theCity of Leipzig. This increases the total number to year's end to 1,300. A cooperative association founded in 1980 under direction of the combine ORSTA-Hydraulik is useful in accelerating the development pace. It includes 33 partners from industry and science. Local government politicians from Dresden, Karl Marx Stadt, Magdeburg and Halle have studied this form of high level cooperation. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 7, Jul 84 p 2] 7994

ROBOTRON STUDENT COMPUTER CENTER--A general agreement on cooperation of the VEB combine Robotron and the District Council of the Dresden district for support of gifted students has been signed during the middle of March. Several topics are included in the agreement. Among others it is agreed that the Robotron combine will set up and maintain a student computer center where talented students will acquire knowledge and skills over a period of four years, during the last year in selected

organizations of the combine and in technical schools in Dresden. In the field of microelectronics for instance, boys and girls deal with programmable electronics, microprocessors, and storage circuits as well as with modeling or robot circuits. Participants in the information science working group learn about pocket calculators and how to effectively program the desk computer K 1003. Provisions are also made to learn the BASIC programming language to permit solutions of problems on the office computer A 5130 or on home computers to further general adult education. The specialist camp "Electronics", conducted by the VEB Robotron during the summer vacation in Radeberg has also proven useful. About 30 students can learn during the 14 day camp sessions about modern development and manufacturing methods for electronic products. Students also can get hands-on experience and they can test their work. In addition the VEB combine Robotron supports the work of two specialized schools and of the "microelectronics" research center of the Academy of Pedagogical Sciences. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 8, Aug 84 p 3] 7994

OFFICE COMPUTER M 118 DESCRIBED--During the end of May of this year the VEB Industry-Consulting Berlin (ICB) sponsored a working meeting on applications of microcomputing technology to consulting activities and to general applications of the office computer system M 118, which is being tested by the ICB at this time. The VEB ICB has for three years been concerned with the field of electronic data processing, specifically with creation and use of system applications and software geared to consulting, among others with evaluation methods of industrial investments in developing countries, specific to capitalist countries. Also considered were problems related to dynamic organizational planning and calculations of alternatives for proposal and study analyses. Software and applications development of the VEB ICB is supported in the framework of its international relationships by the Romanian computer company FELIX through providing the efficient office computer M 118. Representatives of both users and manufacturers presented during the meeting problems and solutions specific to the consulting field, to about 75 participants consisting of experts from combines and factories, of the ministerial area Heavy Machinery and Construction of the GDR, also from universities and other institutions, and alsl provided detailed explanations of hardware and software. Much interest was shown in practical applications of the M 118, among others computer aided construction and planning with an efficient graphics system, applications of higher order languages such as FORTRAN, BASIC, PL/M, COBOL, the compatibility with the computer systems I-100 or I-103 F which are also being used in the GDR, of use for multi-user operation, and of various capabilities of peripheral equipment. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 22 No 8, Aug 84 pp 2-3] 7994

CONFERENCE ON DATABANK OPERATING SYSTEM--In March 1984 a user applications conference on the databank operating system DBBS DAFEMA took place in the VEB Data Processing Center Magdeburg. Participants from 24 organizations learned about experiences with actual data bank applications

and about plans for further development of the DBBS. Two problems were central to the discussions and contributions: new opportunities for applications of DAFEMA with improvements of program components and creation of further utility programs, and the practical experience gained in data bank system development and user requirements for further development of DBBS DAFEMA. The following problems were realized with the program package: restructuring and reorganizing of basic files, utilities for information retrieval, list transfer from magnetic tape to serial printer, transfer of LOG-files to sequential files, support of error detection for the data bank administrator, and content checking for various files. During 1985 the developer will offer a descriptive query language and parts list processor. Users estimated that the range of applications for DAFEMA was in no way limited. There are now 40 applications, most of them dealing with materials handling, production control, and production planning. Users considered simplicity of operation and comprehensibility essential advantages of the system. Another second meeting on the same theme is planned for 1985. [Text] [East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 9, Sep 84 p 21 7994

SLOW INTEGRATION OF ROBOTS CRITICIZED--About 3200 robots are scheduled to be operating in the plants of the capital by the end of the year. We have, as is commonly known, at least three objectives in mind by their use: higher productivity, the freeing of workers for other urgent tasks, and the reduction of hard physical labor. To actually achieve these objectives, however, an optimal utilization of the robots is required. Do they have enough work? This will be answered affirmatively without limitation with regard to the 87 steel workmates at the VEB (nationalized) water supply and sewage treatment plants which are operating almost around the clock, namely 23.5 hours per calendar day. This rate of utilization is at the same time a clear indication that exemplary maintenance and care, sensible integration into the work process, and automatic machinery obviously designed for and targeted to the special tasks of the plant, will also result in the least waiting- and stopping periods. Similar experiences should have been gained at the Stralau glass works, at the Berlin lamp factory, and at the Management of the East German State Railways the robots of which are all being utilized for more than 20 hours daily. These, however, are the peak values, with less pleasant facts at the other end of the scale. There are plants in Berlin which allow themselves to run the expensive automatic machines at full capacity for less than five hours daily. Up to the end of May the utilization time at the VEB "Building Material Supply" was extremely low. Rigorous steps should be taken here and elsewhere immediately to correct this state of retirement. General considerations are all the more called for, since the trend among the newly added robots points to lower utilization time in the first half of the year than in the previous year. Robots--and this is the fundamental experience--are most effective in the production process where they are used to speed it up by functioning as connecting members. None of these robots has ever paid off a lonely island in the production plant. [Text] [East Berlin BERLINER ZEITUNG in German 30 Aug 84 p 3] 12693

COMPRESSED-AIR GRINDING MACHINE--The VEB Niles Berlin began now, four months ahead of schedule, with the production of a new compressed-air grinder. The plant collective belonging to the Tool Combine Schmalkalden has the objective of finishing the pilot production run before the start of the 9th Best Worker Conference (worker with the highest output) in

Berlin. The new product which is in demand as a means of rationalizing operations in tool manufacture and machine construction, foundries and shipbuilding, is lighter and at the same time more efficient than its forerunner. With a circa ten percent lower weight the output of the newly developed machine is increased by about 66 percent. Additional advantages are its reduced noise level and greater convenience in operation. These factors conform, as works manager Wolfgang Dillner stated, to the optimal international values and increase the export chances of the Niles workers. "The first contracts for the new grinder are already signed, also with enterprises in the nonsocialist trading area." This year, the Berlin plant will still deliver 250 machines, while 10,000 are scheduled for delivery in 1985. With the development of the grinder the Niles designers have created at the same time the prerequisite for the renewal of the entire product manufacturing program for compressed-air tools. The new powerful motor employed here is so designed that it can be used also for additional pneumatic tools. This permits manufacturing larger series and thus more efficient motors. Beginning next year, a new material-saving process is to take effect for the production of motor housings. In cooperation with the Oberlungwitz Division of the diesel motor plant Leipzig Niles engineers found a way of pressing the housing parts produced previously by automatic lathes. This makes it possible to save aluminum and steel. [Text] [East Berlin BERLINER ZEITUNG In German 28 Aug 84 p 1] 12693

SPECIAL GRAPHITE FOR MICROCHIPS--The VEB Elektrokohle Berlin-Lichtenberg manufactures over 6000 products based on coke, tar, and pitch. The range of products includes graphite electrodes for the metallurgy, linings for industrial furnaces, graphite brushes for electric motors, as well as silicon carbide heating conductors for the chemical and ceramic industries. The plant fulfills important tasks as a supplier for the microelectronic industry. It participates with its graphite products in various technological stages in the creation of a microchip. Experts of the plant developed a special graphite for this purpose which meets the high demands of purity demanded by the microelectronics. The starting point for a chip is an extremely pure silicon crystal obtained in reactors from trichlorosilane gas at a temperature of about 1200 degrees Centigrade. The silicon contained in the gas is deposited in the process on a silicon core. The electrodes required for the heating circuit are supplied from Elektrokohle. Their composition assures that no impurities are deposited during the heating process. In the next stage the monocrystal is created from this still polycrystalline material. The Berliners supply the graphite parts, such as the necessary crucible, the heaters and other accessories for this process too. In the subsequent process- the epitaxy - the monocrystal, which is cut in extremely thin slices, is heated once more on a heater over which a siliceous gas is passed, resulting in the growth of monocrystalline layer on the slice with a thickness of only a few micrometers. After coating with a light-sensitive lacquer the circuits are then applied photographically. The graphite heaters which are subjected to particularly high demands are used in this process. Their surface structure may not be reproduced on the future microelectronic

component. These parts are therefore coated with silicon carbide or pyrocarbon. Purest graphite from the EKL is also required for other modern processes, such as the manufacture of luminous substances for color picture tubes and the production of photoconductors. L. Landgraf [Text] [East Berlin NEUE ZEIT in German 2 Oct 84 p 6] 12693

SEMICONDUCTOR VEB INCREASES TRAINING--The factory training school of the semiconductor plant "Katja Niederkirchner" celebrated on Friday afternoon the 25th year of its existence in the concert hall. The senior instructor and director of the school, comrade Marianne Klinger, illustrated the development plant's training facility. After the founding of the semiconductor enterprise in the tenth year of the Republic, it proceeded immediately on September 2nd with the training of a new generation of workers. About 70 boys and girls began their apprenticeship on September 2, 1959. Their instructors were seven teachers and masters of the trade. Meanwhile, about 9,500 apprentices and working men and women received their training at this school. According to Marianne Klinger, 80 percent of the employees of the semiconductor plant have qualified at the training facility. Special attention was paid at the semiconductor plant to the development and support of women and girls. In the sixties they were given the opportunity, with the establishment of special study courses for women, of bringing their families and studies into harmony with each other. With the start of the partially automated production of integrated circuits in the year 1971, there were increased demands on the training school of the enterprise. 900 apprentices were to be trained annually from now on instead of 450. A new school building was erected at Beeskower Street, and quite often, as Marianne Klinger remembers, apprentice trainers, instructors, and educators were won over at the bus station in front of the semiconductor plant. The collective of educators has now 225 colleagues. A member from the beginning: Senior teacher Fritz Schaefer. Today the apprentices numbering meanwhile 1,422 are learning to operate the very latest automatic and other machinery, and are already in their first year of apprenticeship reliable producers of such products as pasture fencing devices with a value exceeding eight million marks. During the festivities on Friday the collective of the training school of the plant was honored with the prize of the plant manager. [Text] [Frankfurt/Oder NEUER TAG in German 11 Sep 84 p 8] 12693

CSO: 2302/26

DEVELOPMENT OF MICROPROCESSOR TECHNOLOGY OUTLINED

Design, Software Difficulties

Warsaw INFORMATYKA in Polish No 6, Jun 84 p 1

[Article by Janusz Zalewski: "Microprocessor Technology 1 Year Later"]

[Text] What changes have occurred in the development of microprocessor technology in Poland since last year, when entire issues of INFORMATYKA were devoted to this subject? It turns out that 18 months is too short a time for any kind of basic reversal to occur in this area, or even to observe greater changes.

Production of the RTDS and MSWP assistance systems, which were described in INFORMATYKA No 1, 1983 and BIULETYN MERA No 4, 1983 and No 5, 1983, has been initiated, and it appears that there is nothing new to say about this subject. However, we expect to receive reports on the quality and functionality of these systems as their use becomes more widespread. The evolution of the PSPD-90 programmed data preparation station toward a universal configuration, which above all serves as an aid in the design of microprocessor systems, is a pleasant surprise. Work toward this universal configuration has certainly been prompted by the continuing shortage of tools for designers of microprocessor systems. Thus, development work on the EMU-48 mobile system, which is designed for Polish single-structure microcomputers, should be followed with greater interest. Although these microcomputers are not yet on the market, it could be that we will soon hear about the initiation of Polish production of 4- and 8-bit microcomputers, but for now we must be satisfied with their description. They will be systems that will have modest computational capabilities, that are designed primarily for applications in general-use equipment or for simple professional applications (see PAK No 1, 1984). That is why the microsystem producer is getting more involved in designing mobile systems.

In general, the list of tools required by designers is quite long and includes software as well as hardware. A PROM programmer is one of the basic tools every design group must have. A very desirable programmer characteristic is that it should be universal, even though it may be difficult to adapt to the parameters of all the memories that are or will be available on the market. The lack of a domestically produced programmer is forcing designers to design such tools on their own. This would be an unthinkable situation in the technically higher developed countries. In these countries, if a design group

needs equipment, such equipment can be purchased; because almost none of these groups designs such tools themselves, such equipment is available on the market as soon as there is a demand. In Poland, the situation is just the reverse.

Such a path was taken to build the PROG-2 programmer needed to develop the MSM system, which is currently well equipped with hardware. The codesigners of this system (INFORMATYKA No 2, 1983) could most certainly say much more about the experiences gained during its design; they do on other occasions (domestic and international conferences), providing testimony of their own solutions to microprocessor system design problems. Unfortunately, not too many new solutions are available--at least I am not aware of them. For example, the 16-bit MERA-60 microcomputers have a life of their own that is seemingly independent of technological advances. I believe it would be desirable to miniaturize them because they give the impression of being minicomputers and can become less competitive with the passage of time. Among the other configurations described in INFORMATYKA No 2, 1983, the Mikroster system stands out (SYSTEMY MIKROPROCESOROWE No 12, 1983), which is now being produced by UNITRA-CEMI in Szczytna (PAK No 3, 1984). If this system turns out to be sufficiently universal and, above all, reliable, then it can be very competitive with other modular systems. Our industry's inertia, however, allows little hope that this state of affairs will change.

But the designers of the CAMAC equipment, which was described in INFORMATYKA No 2, 1983, are not interested in partial solutions, that is, solutions based on a low-capacity bus or that deviate from world standards, and they probably will aim toward a more universal design. Thus the articles in this current issue concerning the two latest modular systems, the VME and Multibus II buses, should be read with great care. Both standards permit the design of systems that are complete microprocessors in a single cassette, as well as combining numerous cassettes. Both standards also lend themselves to the designing of small 8-bit systems as well as large multiprocessor configurations based on 16- or 32-bit microprocessors. Their real advantages appear only in the second case. After all, they are not just ordinary interfacing devices but are standardized configurations designed to create very complex computational units, and thus are of future significance to Poland. It should be remembered, however, that in this area in Poland the present is the future and at times it is the past in the West.

A real "bus" war is going on in the West, which was not noticeable a year ago. Intel and Motorola, who are battling for the market, are competing with one another to create technically better systems. The VME specification is barely 3 years old, and about 60 manufacturers, who belong to the recently organized VME Bus Manufacturers Group, are now producing boards for this system (about 200 types). Although this is a system that is designed basically for the Motorola 68000 microprocessor, controllers also exist that are based on other 16-bit microprocessors, for example, the Z8000 and NS16032. On the other hand, Intel, realizing that the Multibus I system is gradually becoming outmoded (despite the existence of about 1,000 different types of modules produced by 170 firms), has spent 2 years developing a system that is suitable to more modern requirements (the incompatibility between Multibus I and Multibus II is resolved by creating hybrid configurations). Several other American companies,

such as Foxboro, NCR, Prime and Tektronix, as well as West Germany's Siemens then declared their willingness to collaborate in the realization of this standard. This is very important, and the quick adoption of an appropriate Polish standard could be very beneficial (see the article on couplers: INFORMATYKA No 4 and No 5, 1983).

In the Western countries, the problem of selecting the VME or Multibus II bus is related to product availability, and even though Multibus II is the latest system, VME-standard boards are already being produced. In Poland, since neither standard type boards are available, perhaps the Multibus II bus should be chosen because it is the latest bus and it is compatible with Intel products.

Of course, forced standardization makes no sense, but in selecting what computer equipment should be produced, reason should prevail. Undoubtedly, it is much easier and cheaper to produce from one to several types of specialized boards in accordance with a uniform standard in each of several plants than to produce a complete system in these plants and thus the entire range of boards in accordance with individual plant standards. To estimate the effects of no standardization, one only has to multiply the average cost of developing a single board by the number of standards. Of course, the benefits of standardization do not depend only on avoiding unnecessary developments, because standardized production facilitates the expansion of assortment and increases the production of products. However, the question of agreeing to a Polish standard remains open.

What can we expect in the microprocessor field 1 year hence? Of course, this technology is developing rapidly; the appearance of mikroKLAN in our columns is the smallest expression of this. In practice, however, shortages of components and equipment continue, even though it can be seen that the situation is improving gradually. Much development work is being conducted as indicated by the greater number of articles being published in the periodicals and conference materials. However, very little continues to be known about microprocessor applications, and they are not part of our environment. One continues to see a lack of progress in the field of multiprocessor systems. It turns out, however, that under Polish conditions it is not easy to design and develop multiprocessor configurations that are of practical use. For this reason and because there is a need to standardize simpler configurations, selecting a Polish design standard is becoming more urgent. The status of microprocessor technology in Poland that was presented here will be continued in the next issue and will concern software.

Microcomputer Software Shortages

Warsaw INFORMATYKA in Polish No 7, Jul 84 p 1

[Article by Janusz Zalewski: "Microprocessor Technology--What Do We Lack?"]

[Text] Most certainly we lack microcomputer software, which can be seen with the naked eye by scanning INFORMATYKA's contents. To date, not much attention has been paid to this theme in our columns. In this current issue we are making the first attempt to gather material concerning software for microcomputer systems used in Poland.

Of course, microcomputer software encompasses a very wide range of products, from the simplest computer game programs to program generators. In this issue, the emphasis is being placed on basic software; application software is not considered. Above all, good basic software should be hardware compatible, versatile and easy to use. In all probability, according to these criteria some differentiable types of microcomputer software stand apart; they are closely related and intermingled, but they possess a number of specific characteristics--operating systems, compilers and program tools.

Above all, high-level language makes software easy to use. The statement that in using assembler languages one will not overcome the world or popularize information science, even though they can be used to realize any algorithm, has been known for a long time. Thus, the purpose of PL/M was to replace the assembler languages for Intel's 8-bit microcomputers. FORTH is a totally different language that competes with PL/M. Undoubtedly, FORTH is more difficult to master, but it is becoming much more popular than the rest. BASIC, the most popular microcomputer language, will not be discussed in this issue because it already has been discussed in INFORMATYKA Nos 5, 6, 7 and 8 (1983), and before long we will describe its development under the influence of microprocessor technology (incidentally, lessons in BASIC for novices were initiated in HORYZONTY TECHNIKI Nos 2 and 4, 1984). If we include PASCAL with BASIC, then the tendency to eliminate assembler languages will be clearly illustrated. However, none of the currently used translators for the mentioned languages for microcomputers exists in Poland. Can they?

Work on PL/M was initiated by Microcomputer Applications Associates, a small firm, in 1972 at Intel's request. The first article on this subject that I know of was published 2 years later by Gary Kildalle (ELECTRONICS Vol 47, No 13, p 103, 27 June 1974). FORTH likewise did not develop on its own. Its author, Charles Moore, gradually improved his idea, starting in the early 1960's! But it was only in 1971 that another person appeared who programmed in this language, at the National Radio Astronomy Observatory, Kitt Peak, Arizona, where the first general system came into being, but not for microcomputers. The first article on this subject was published 2 years later (PROCEEDINGS OF THE IEEE Vol 61, No 9, p 1346, September 1973). Therefore, if it takes 10 years of use for a language to be established and to become pre-eminent, then it should be no surprise to anyone that indigenous compilers for these languages are not in operation in Poland; we lack consistency of action.

The same applies to operating systems, which is represented in this issue by CP/M (with these articles we are continuing the theme that was initiated last year). The simple monitors used in most of the microcomputer systems described thus far in INFORMATYKA are far too inadequate to assure good interfacing with hardware and thus good utilization of hardware. A modern operating system should fulfill a number of general conditions that as a rule are impossible to satisfy, and therefore these systems are divided into two categories: software generation systems, which include CP/M and XENIX (based on UNIX), and systems for operation in real time, such as Intel's RMX. The CP/M operating system came into being in 1974 and was written in PL/M, which Intel used to write the first version of its own RMX operating system. It is estimated that CP/M and its derivatives are used in several hundred thousand installations and in

several thousand configurations. Thus the problem arises: To what extent should the Polish operating system be independent and original, and would such a system make sense?

A good operating system and compiler mean much, but are not enough in themselves for effective operation. To this end, a versatile programming center is needed. Thus, in addition to editors, translators (assemblers) and programs to test other programs, of which we have many and in different versions, we also need many different service routines, for example, routines to permit documentation of programs, to operate graphics equipment and so forth, which have never existed in Poland. Generally speaking, we lack programming tools. Once again, CP/M is an example here. The latest catalog includes descriptions of 2,000 software packages operating under the supervision of this operating system (CP/M Software Finder, 3d edition, Digital Research, Pacific Grove, CA, November 1983). Such software can exist only on the basis of a component operating system that, above all, has a good records system.

In thinking about the future, however, it should be remembered that CP/M is a single-use and single-task system. The current trend toward multiprocessor microcomputer configurations can lead to sudden changes in our conceptions of software. We only know what characteristics are required of languages for programming multiprocessor systems (after the initial experiences with ADA, CHILL, MODULA and the like). Knowing the characteristics of operating systems (even though their derivatives, such as MP/M, CP/NET and the synchronous CP/M, now exist) is more difficult, but very little is known about a center to program such systems or about proper tools (for example, a tool to allocate tasks to specific processors).

Inasmuch as we know what the goal is in this area abroad, there is not much to say about this work in Poland. We can only say what we lack. Poland does not have a large center for programming microcomputers. There are small groups of enthusiasts, but not teams. If someone asked me if Poland needs to create a "Software Production Center," I would reply in the affirmative without hesitation. But if I am then asked if I believe in the efficiency of its operation, my reply would be negative.

It appears to me that the planned activities concerning the development of Polish software for microcomputers (see J. Danda, INFORMATYKA No 1, 1983), which after all never gathered much momentum, are being restrained for many reasons. For example, the completely developed MODULA compiler is not successful, the B.ITE.M library (ZETO Lodz) is not prospering as well as it should, and training users to do their own programming only at the microprocessor schools is much too little. Much more effort is needed on our part.

Just as we were unable in the past to manufacture a computer built in accordance with our own ideas, so too it will be difficult to write software in accordance with our own patent. In observing the developments in this area, I believe that Gary Kildalle's reply with regard to his CP/M is the final word: "Refinements? My friend, they are up to you."

11899
CSO: 2602/5

MODERNIZATION OF INDUSTRY WITH ROBOTS ASSESSED

Warsaw PRZEGLAD MECHANICZNY in Polish No 14, Jul 84 pp 1, 2

[Article by Zbigniew Strojewski: "Industrial Robots as a Vehicle of Modernization"]

[Text] Over the next decade, modernization is anticipated to take place in existing plants and production departments of all ministerial sectors of the national economy. Automation of the production process is among the methods that will enable industry to fulfill its tasks. Special-purpose automation with a narrow range of applications and inflexible programs, which are in frequent use, permit increases in productivity and output but their utilization is profitable only in cyclical mass production. Mass production of uniform items over prolonged periods becomes untenable because of the mounting necessity to diversify products offered to the market due to pressures generated by consumer requirements. This is followed by reductions in production cycles. Flexible production engineering is becoming a necessity; therefore, the development of flexible automation centered on easy reprogramming of automated equipment is indispensable.

Flexible Automation

Automation will be introduced into industry in the form of flexible processing systems, integrated welding lines (especially in point welding), robot-equipped positions for molding, painting, and similar operations. This requires uniform development in all structural components of the production process.

Arguably the most widespread measure of flexible automation are systems for numerical control of machine tools. The advances in digital techniques and integrated circuit technology have provided for advantageous developments in such systems, paralleling the evolution in logical control systems for other types of production equipment, their propelling devices, and transport and handling apparatus.

The current trend is to unify subassemblies based on integrated circuits and to standardize the design decisions and functional variants in numerical control systems for machine tools, industrial robots, and other types of production engineering devices. A common control technology is seen in the

programmed control units, developed vigorously over the last few years and applied in flexible production engineering in mass production.

Flexible automation of diverse functions and labor-intensive manipulations now performed by humans is becoming possible due to the applications of industrial robots.

That is to say, compelling reasons for the use of industrial robots include improvement in labor productivity, product quality, and replacement of human labor at work stations where the environment is detrimental to employee health and life. With the passage of time, the last factor will become increasingly important. People will simply refuse to work at some stations (due to the monotony and low attractiveness of work, e.g., press operators, assembly lines), while some other work stations should be vacated by humans because of major hazards to their health and even life. It is evident, therefore, that no economic setting, and especially the country's present economic situation, should be allowed to cause a deceleration in the pace of work on the problems of robotization.

Directions of Development in Robot Design

Scholarly and technological activities concerning industrial robots have been conducted for a fairly long time by many research and development institutions in Poland, including:

--the institutes of Warsaw Polytechnical University, e.g., Aviation Technology and Applied Mechanics Institute (propulsion and control systems, bionic systems), Industrial Automation Institute (control systems, hydraulic and pneumatic systems), and Mechanical Technology Institute (control systems, pneumatic propulsion);

--PAN's Biocybernetics and Biomedical Engineering Institute (control systems, electrical propulsion, bionic systems).

Studies involving industrial robot design variants (propulsion and control systems) and their industrial applications were begun in Poland in the 1970's within the following facilities of the machinery industry sector:

--Precision Mechanics Institute (control systems, pneumatic and hydraulic propulsion systems);

--Industrial Institute for Automation and Metrology (control, pneumatic propulsion and electrical propulsion systems);

--Machine Tools Research and Design Center (control systems and hydraulic propulsion);

--Tekoma Machine Basic Technology and Design Research and Development Center (control systems and pneumatic propulsion).

Overall, the accumulated experience in industrial robots, both completed and under development, indicates that the current level of design decisions matches to some extent the anticipated directions of demand (for robotization of particular engineering techniques). This primarily applies to RIMP-type robots completed and being developed at the Precision Mechanics Institute (RIMP-401, RIMP-402, RIMP-1000 and RIMP-900) and the robots developed by MERA-PIAP (PR-02 and, license-based, IRb 6, IRb-60) as well as the PRO-30 robot developed by CBKO and the numerous manipulator units completed or currently being developed by OBR Tekoma.

A scrutiny of robot design development reveals two principal directions: growth in robots with a fairly univerals range, and specialized (or "targeted") robots. On the basis of current levels of development in industrial robot design worldwide, it is seen as purposeful to develop the production of industrial robots within a broad range of types. This stems from technological and economic premises, as in many cases it is profitable to develop and manufacture a robot with precisely specified characteristics, in other words, a specialized or "targeted" robot for the automation of a particular production process or technological operation, rather than applying a universal robot with technical and operating characteristics in excess of those required, and a resulting high cost.

While attempting to combine universality of structure with economic sense in the development of a robot, attention should be paid to the advantages of applying robots with modular structure. Modular design permits unrestricted combination of function units so that, depending on the needs of a job station to be robot-manned, it is possible to create a design appropriate in terms of the number of degrees of freedom, type of motions, and dimensions.

Robot applications involve the furnishing of auxiliary equipment at a cost ranging from 0.3 to 1.5 of a robot's value. These are gripping and positioning devices, of which the first, clamps of various types, should be offered by robot manufacturers. As robot applications progress, however, the more experienced user plants will be able to make gripping devices on their own. Devices of the second type, which position an object in relation to a robot (feed mechanisms, hoists, pallets and similar devices), should be made by robot manufacturers or by the machine tool industry if they are of the all-purpose type.

Economic Aspects of Industrial Robot Applications

Economic efforts of robot use are evaluated by methods similar to those applied in other kinds of modernization projects permitting increases in labor productivity via mechanization and automation.

To determine the outlays involved in the installation of a robot, the following components are taken into account:

--outlay for the design of a job station,
--price of the robot,

--outlay for special hardware for the robot (grippers, technological heads),
--outlay for auxiliary equipment (hoists, storage units),
--outlay for job station software,
--outlay for the construction of the work station and its integration into the production line,
--outlay for operation and maintenance of the work station.

Immediate effects of industrial robot applications include labor savings, elevated labor productivity, decreases in production losses (due to improved quality), savings in materials, and elimination of difficult job conditions.

Indirect economic gains which, as a rule, are not specifically calculated, include the prevention of additional payments for overtime and for work under hazardous conditions, and medical care. The share of these additional payments is estimated at 20 percent of payroll cost savings.

The period of depreciation and profitability of the project are indicative of the expedience in installing a robot. The societal aspect of robotics should also be considered. Depreciation periods may differ for robots depending on their range of purpose, type of technology within which a robot is installed, and many other factors. According to data from the leading countries, such periods range from 2 to 5 years. The savings resulting from robot installation can also be determined by the number of replaced workers and the value of production generated by those workers if employed at other job stations.

State financing of pilot projects in robotization should be viewed as correct and compatible with the goals. Such practices are used by highly developed countries in the early phase of robotization. Therefore, if production growth is desired while labor is short, all possible conditions should be assured for the manufacture and implementation of robots in industrial enterprises.

In the initial phase of the next few years, the state should function as a sponsor through a system of subsidies and tax exemptions. This will permit the introduction of robots first of all in those locations where they are of major importance for production and working conditions. At the same time, this will help overcome a kind of resistance that is naturally engendered whenever technological innovations are introduced.

The costs involved in the implementation of pilot projects need not be covered in full by the government. The projects can be organized so that a substantial proportion of the work, e.g., contracting for installation devices and technological hardware necessary for a specific project, can be provided by the plant in which the project is run. It is also possible to set up joint teams of designer and production engineers from plants and scholarly institutions. This approach would provide for the acceptance of technological innovation by plant work forces.

All of these are forms of institutionalized action. It is important to make it clear in the initial phase that a plant's risk is reduced to a minimum. In extreme cases, a successful pilot project would result in reimbursement of total costs incurred by a plant.

8795
CSO: 2602/46

PLANS FOR AUTOMATION, USE OF ROBOTS DISCUSSED

Bucharest STIINTA SI TEHNICA in Romanian Sep 84 pp 5-6

[Article by Aristide Predoi, director general of the Institute for Scientific Research and Technical Engineering in Automation and Telecommunications]

[Excerpts] The achievement of priority objectives for rapid growth in labor productivity, and in general, for higher efficiency in all socioeconomic activities, definitely involves the introduction of the most advanced technologies and an accelerated technologic progress, through expanded automation, robotization, and computerization together with the penetration of microprocessors.

Without a labor productivity at the same level as that of developed countries, we cannot say that we have moved beyond the stage of developing nation. The achievement of higher productivity however, does not require stronger physical efforts, but more intensive design aimed at more extensive mechanization and automation, the application of modern technical processes, the introduction of the most advanced technologies, and the rapid transfer of new research and design results to production. All of these, with optimum technical-economic indicators and the most efficient consumption of raw and other materials, as well as energy, so that by 1985, for instance, we may obtain a production of means of automation 2.1-2.3 times higher than that of 1980, with a consumption of equivalent absolute value. To meet these requirements, new actions and activities must be undertaken in the electronics, automation, computer, and robot industries, in keeping with the measures stipulated in the Program for Greater Labor Productivity Growth and for Improved Work Organization and Standardization During the 1983-1985 Period and By 1990, as well as in the Program Regarding Improvements in the Technical and Qualitative Level of Products, Reduced Consumptions of Raw Materials, Fuels, and Energy, and Superior Exploitation of Raw and Other Materials During the 1983-1985 Period and By 1990, programs that are of maximum importance for the country's social and economic progress.

These programs, formulated at the initiative and under the direct guidance of the secretary general of the party, Nicolae Ceausescu, are an integral part of a comprehensive collection of actions and measures that are of considerable theoretical and practical value, consistent with the Directives Project of the Eighth Congress of the RCP, regarding the intensive development of the

national economy at the present stage, stage at which qualitative, technical progress, and economic efficiency factors play a predominant role in the strategy for economic growth, and are of decisive importance for the country's continued development.

Leading Edge of Electronics

In general, socioeconomic and industrial development is inconceivable without the contribution of automation, also known as the leading edge of electronics. The rates of development of production in the automation and electronics branch are generally higher than those in other branches. The areas of production of means of automation, electronics, and computer technology, are those which derive the greatest value from materials, metals, labor, and intelligence, making it possible to create highly valuable products with minimal consumptions of materials, energy, and human effort. At the same time, automation, electronics, and computer equipment incorporated into technical tooling and robots add a significant value to these tools through software programs and information processing, by increasing yields and operation flexibility, and by expanding the management capabilities of human operators.

In Romania, as a result of more intensive redesign and modernization of products in current production, improved design for those being adopted, and a broader range of manufactured goods through the adoption of high technology products, the proportion of world-class products will increase from about 69 percent in 1985, to 84.6 percent in 1987, and will approach 95 percent in 1990. Similarly, 2-5 percent of the products will surpass the level achieved in the rest of the world. At the same time, in order to assure the growth levels of labor productivity, particularly in sectors with a high volume of labor, the proportion of production achieved with mechanized and automated systems will reach an average of 65 percent in 1985, about 70 percent in 1987, and more than 90 percent in 1990.

During the 1983-1985 period, and by 1990, the restructuring and advanced exploitation of processing branches will have to be continued in order to obtain high technology products that consume little energy, by creating or developing new sectors such as microelectronics, industrial robots, and equipment for nuclear power plants, and for new forms of energy, aviation, laser equipment, and optical fibers. We must point out that in advanced fields such as electrical engineering and electronics, we have planned to obtain in 1985, products whose performance/cost ratio will be twice that of 1980. By 1990, this this ratio will double once more. At the same time, we must establish the proportion of products which during the 1984-1987 period will reach the quality level of those on the world market, as well as directions for defining the groups which will compose the 2-5 percent proportion of products whose quality will surpass world-class levels.

These trends demonstrate that the emphasis in component production must be placed on the organization and development of microelectronics and the assimilation of advanced technologies, which will allow the fabrication of new types of microprocessors. And to assure technical progress, including in power electronics, the production of discrete active and passive components will develop toward high performance and high reliability power models.

To assure support for these measures, scientific research in enterprises, in institutes for research and technical engineering, and in universities, will play a significant role, stressing the exploitation of our own intelligence.

Objectives of Scientific Research and Technical Engineering

As the secretary general of the party, Nicolae Ceausescu, has pointed out on numberless occasions, we must shift with great courage to computer-assisted production design and management activities, which to an unimaginable extent, will reduce physical effort, increase labor productivity, and intensify the consequences of normalization, of reutilization of solutions, and of standardized components and subassemblies, all of which will produce an effective qualitative leap in production. In scientific research and technical engineering activities, it is imperative to coordinate production, research, and education, so as to create new products and activities that will satisfy the needs of the economy, as well as provide a higher exportation volume.

A concrete response to the objectives that are facing research and technical engineering, are the actions taken to introduce technical progress and the most advanced technologies through:

The program for computer-assisted research and design, whose mechanical aspects involve ICTCM (Technological Research Institute for Machine Construction) and the Titan ICSIT (Institute for Scientific Research and Technical Engineering), and whose electronics functions involve IPA (Institute for Automation Research and Design), ITC (Institute for Computer Technology), and ICPE (Research and Design Institute for the Electrical Engineering Industry), all of them in Bucharest, together with units in the electronic, electrical engineering, machine-tool, and machine construction industries;

The program for computer-assisted automatic testing, which involves IPA, ITC, and ICCE (Research Institute for Electronic Components), all of them in Bucharest, together with industrial units from CIETA (Industrial Central for Telecommunications and Automation Equipment) and CIETC (Industrial Central for Electronics and Computer Technology), as well as from automation schools and departments at the Bucharest and Cluj-Napoca polytechnic institutes, and at the University of Craiova;

The robotics program which involves the Central Institute of MIMUEE (Ministry of the Machine-Tool Industry, Electrical Engineering, and Electronics), the Central Institute of MICM (Ministry of the Machine Building Industry), units from CIETA, CIETC, and CIMU (Industrial Central for Machine-Tools), the Central Institute for Management and Information Processing in Bucharest, as well as specialized schools and departments in polytechnic institutes and universities.

11,023
CSO: 2702/1

END